creative computing

August 1980
vol 6, no 8
$2.50

the #1 magazine of computer applications and software

Summer Fun and Games Issue:
- **Computer Bismarck • Knight's Tour**
- **Guess My Animal • Turnablock Game**
- **Fifteen and Hot • Mind Exerciser**

Stocks and Listed Options

The Creative Process

Evaluations: Magic Wand, VisiCalc, Beta-80, Asteroids in Space

Insertion Sort

Columns: Apple, Atari, TRS-80, Puzzles, Legal Forum, Reviews, Effective Writing, Intelligent Games

The easiest, least expensive way to generate spectacular multi-color graphics, sharp two-color alphanumerics: Your computer, a color tv set and the Percom Electric Crayon™.

Add the Electric Crayon™ to your system and your keyboard becomes a palette, the tv screen your medium.

You dab and stroke using one-key commands to create dazzling full-color drawings, eye-catching charts and diagrams.

Or you run any of innumerable programs. **Your own BASIC language programs** that generate dynamic pyrotechnic images, laugh-provoking animations.

From a combined alphanumerics-semigraphics mode to a high resolution 256- by 192-element full graphics mode, the microprocessor-controlled Electric Crayon™ is capable of generating **10 distinctly different display modes.**

Colors are brilliant and true, and up to eight are available depending on the mode.

As shipped, the Electric Crayon™ interfaces a TRS-80* computer via your Expansion Interface or Printer Adapter. It may be easily adapted for interfacing to any computer or to an ordinary parallel ASCII keyboard.

But that's not all

The Electric Crayon is not just a color graphics generator/controller.

It is also **a complete self-contained control computer.** With built-in provision for 1K-byte of on-board program RAM, an EPROM chip for extending EGOS™, its on-board ROM graphics OS, and a dual bidirectional eight-bit port — over and above the computer/keyboard port — for peripherals. The applications are endless.

Shipped with EGOS™, 1K-byte of display memory and a comprehensive user's manual that includes an assembly language listing of EGOS™ and listings of BASIC demo programs, the Electric Crayon™ **costs only $249.95.**

Options include:

- LEVEL II BASIC color graphics programs on minidiskette: $17.95.
- A 34-conductor ribbon cable to interconnect the Electric Crayon™ to a TRS-80*: $24.95.
- RAM chips for adding refresh memory for higher density graphics modes: $29.95 per K-byte.
- Electric Crayon™ Sketchpad, a sketching grid of proportioned picture elements (pixels) in a tv aspect ratio. For 128 x 192 or 256 x 192 graphics modes. 11-inch by 17-inch, 25-sheet pads: $3.95 per pad.

SYSTEM REQUIREMENTS: the video circuitry of the Electric Crayon™ provides direct drive input to a video monitor or modified tv set. An internal up-modulator for rf antenna input may be constructed by adding inexpensive components to the existing video circuitry.

Prices and specifications subject to change without notice.

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* = trademark of Tandy Radio Shack Corporation which has no relationship to Percom Data Company.

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Get into computer color graphics the easy, low-cost way with a Percom Electric Crayon™. Available at Percom dealers nationwide. Call toll-free, 1-800-527-1592, for the address of your nearest dealer, or to order direct if there is no Percom dealer in your area.

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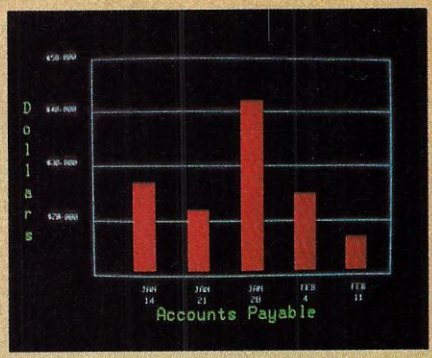

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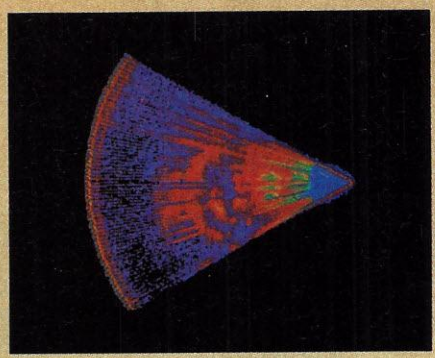


Ultrasonic heart sector scan

High-resolution display with alphanumerics

Get the professional color display that has BASIC/FORTRAN simplicity

LOW-PRICED, TOO

Here's a color display that has everything: professional-level resolution, enormous color range, easy software, NTSC conformance, and low price.

Basically, this new Cromemco Model SDI* is a two-board interface that plugs into any Cromemco computer.

The SDI then maps computer display memory content onto a convenient color monitor to give high-quality, high-resolution displays (756 H x 482 V pixels).

When we say the SDI results in a high-quality professional display, we mean **you can't get higher resolution than this system offers in an** NTSC-conforming display.

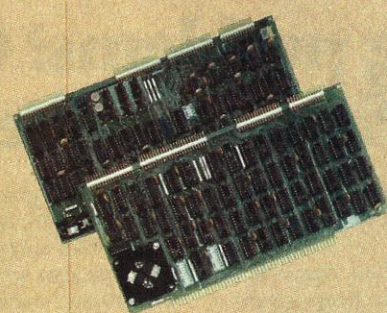
The resolution surpasses that of a color TV picture.

BASIC/FORTRAN programming

Besides its high resolution and low price, the new SDI lets you control with optional Cromemco software packages that use simple BASIC- and FORTRAN-like commands.

Pick any of 16 colors (from a 4096-color palette) with instructions like DEFCLR (c, R, G, B). Or obtain a circle of specified size, location, and color with XCIRC (x, y, r, c).

*U.S. Pat. No. 4121283



Model SDI High-Resolution Color Graphics Interface

HIGH RESOLUTION

The SDI's high resolution gives a professional-quality display that strictly meets NTSC requirements. You get 756 pixels on every visible line of the NTSC standard display of 482 image lines. Vertical line spacing is 1 pixel.

To achieve the high-quality display, a separate output signal is produced for each of the three component colors (red, green, blue). This yields a sharper image than is possible using an NTSC-composite video signal and color TV set. Full image quality is readily realized with our high-quality RGB Monitor or any conventional red/green/blue monitor common in TV work.

Model SDI plugs into Z-2H 11-megabyte hard disk computer or any Cromemco computer

DISPLAY MEMORY

Along with the SDI we also offer an optional fast and novel **two-port** memory that gives independent high-speed access to the computer memory. The two-port memory stores one full display, permitting fast computer operation even during display.

CONTACT YOUR REP NOW

The Model SDI has been used in scientific work, engineering, business, TV, color graphics, and other areas. It's a good example of how Cromemco keeps computers in the field up to date, since it turns any Cromemco computer into an up-to-date color display computer.

The SDI has still more features that you should be informed about. So contact your Cromemco representative now and see all that the SDI will do for you.

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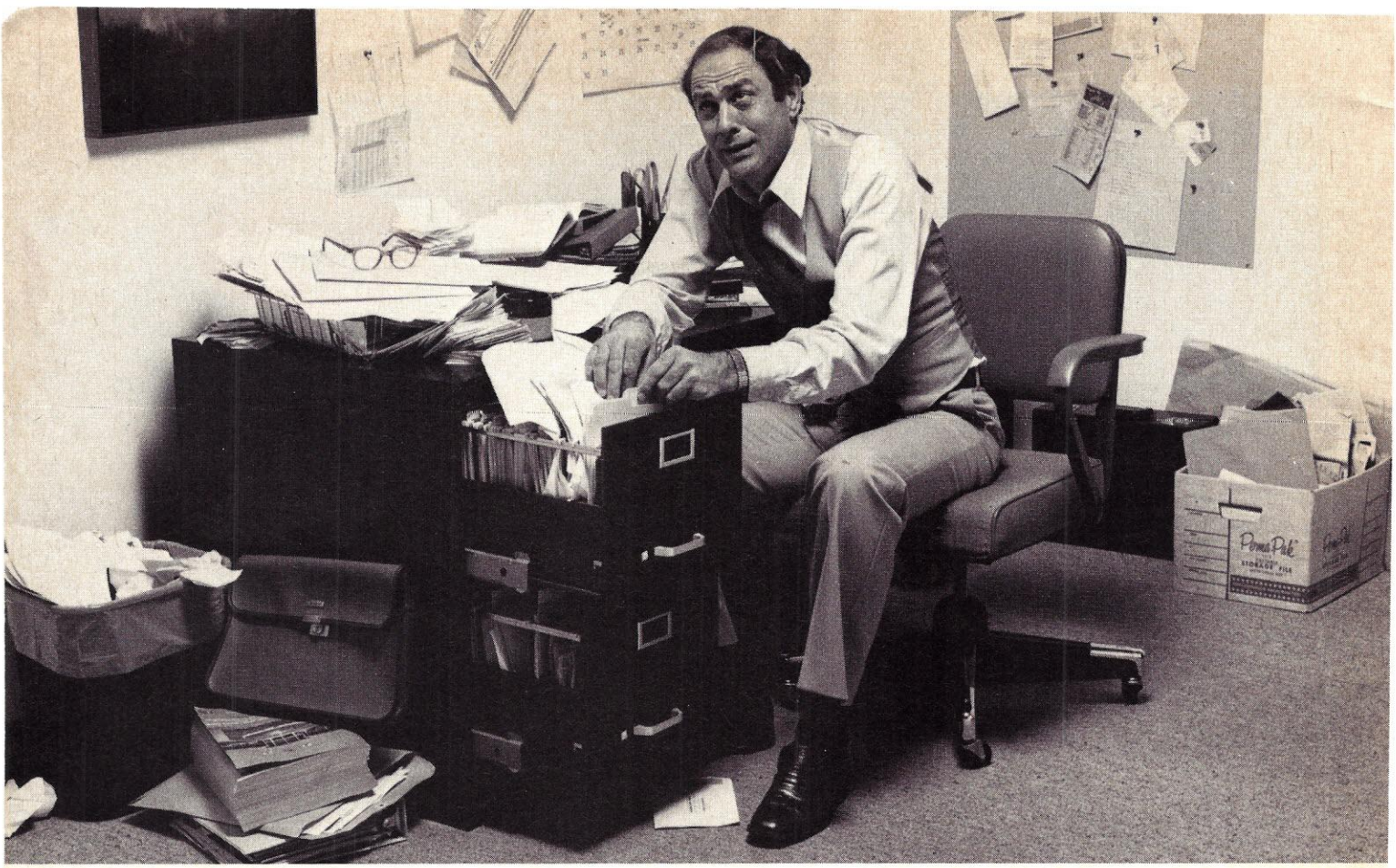

Record keeping problems? Our CCA Data Management System solves them easily.

Having information at your fingertips can make your job a whole lot easier. And that's what the CCA Data Management System is all about.

With this Personal Software™ package and an Apple II™ or TRS-80™ disk system, it will be far easier to keep inventories, customer lists, accounts receivable and payable records, patient histories and many more items.

In fact, you can use the CCA DMS for all of your data management needs, rather than buying (expensive) or writing (time consuming) separate programs for each application. That's because DMS lets you create your own filing systems, adapting itself to the types of records you keep. You specify the number and names of each data field—without any programming.

With DMS keeping all of your records, you only have to learn how to use one system. That's easier, too. It's menu driven, with plenty of prompts to help you create files and add, update, scan, inspect, delete, sort, condense and print data. Our comprehensive 130-page step-by-step instruction manual even provides complete "how to" inventory and mailing list applications so you can start processing immediately.

DMS is a very powerful system, with more file and record storage capacity than other data base programs on the market. And it also gives you greater data handling flexibility. To customize DMS, write add-on BASIC programs that read or write DMS files and perform any kind of processing you want.

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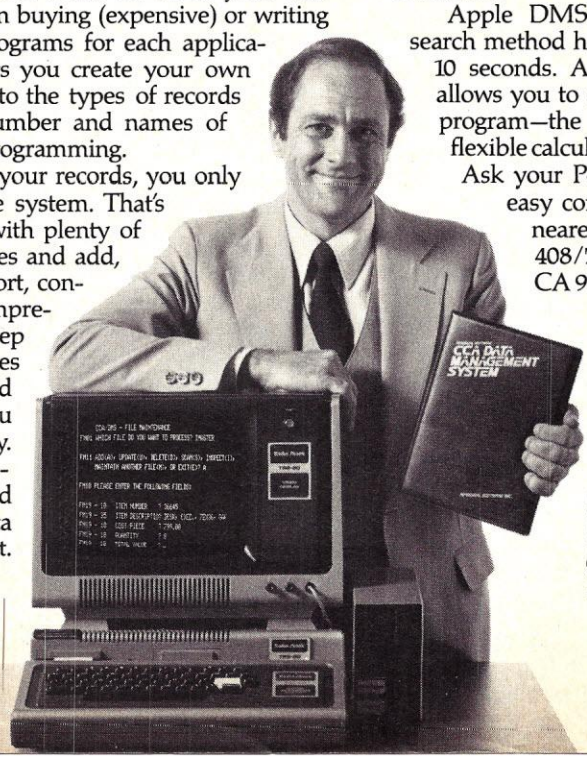

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Creative Computing magazine is published monthly by Creative Computing, P.O. Box789-M, Morristown, NJ 07960. (Editorial office: 51 Dumont Place, Morristown, NJ 07960 Phone: (201) 540-0445.)

Domestic Subscriptions: 12 issues, $15, 24 issues $28, 36 issues $40. Send subscription orders or change of address (P.O. Form 3575) to Creative computing, P.O. Box 789-M, Morristown, NJ 07960. Call 800-631-8112 toll-free (in New Jersey call 201-540-0445) to order a subscription (to be charged only to a bank card).

Controlled circulation paid at Concord, NH 03301.

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The Cover

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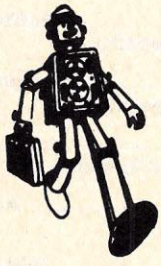

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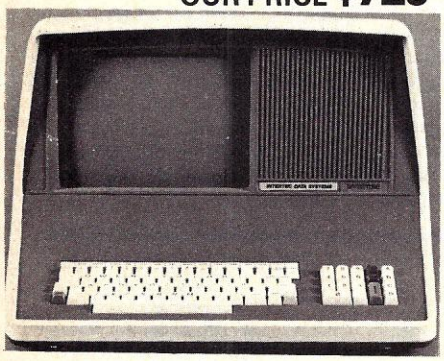

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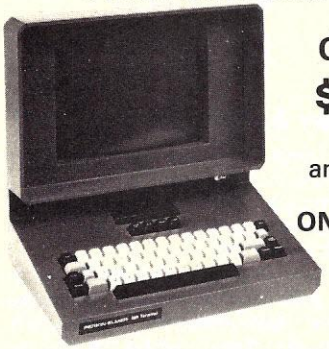

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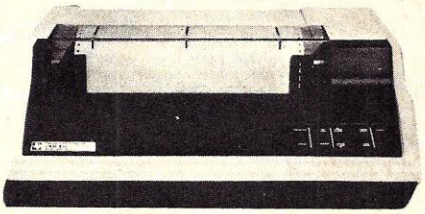

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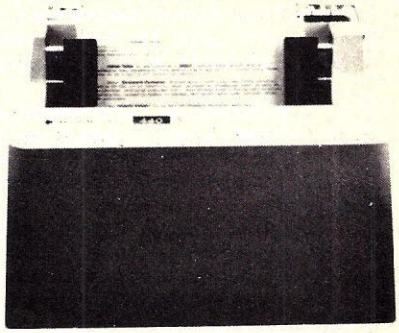

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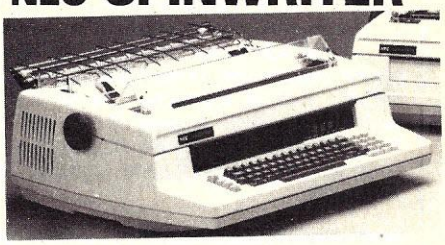

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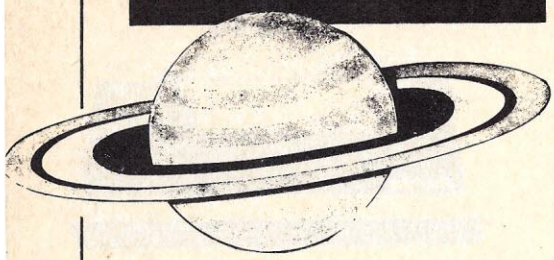


$100,000 Prize Established For Computer World Chess Champion

Carnegie-Mellon University is establishing a $100,000 prize for the first computer program to become World Chess Champion and the beginning of annual computer-versus-human competition. Called The Fredkin Prize, it has been established by the Fredkin Foundation of Cambridge, Mass.

The competition will be monitored by the International Joint Conference on Artificial Intelligence (IJCAI) of Menlo Park, California. CMU will act as a trustee for the prize until it is awarded.

Dr. Hans Berliner of the CMU Computer Science Department, himself a former World Correspondence Chess Champion and author of the computer backgammon program that last year defeated the World Backgammon Champion in Monte Carlo, will head a committee to formulate the precise rules under which the competition will be held.

Winning the championship is a long process that takes four years for a human, and the computer likewise will have to work its way up the ladder in tournament play.

In the interim, a set of incentive prizes will be offered each year for computer-versus-human competition. In each succeeding year, the skill level of the human players will be increased as will the amount of the prize. The first competition will be held this November at CMU and the prizes will be $1,500 and $1,000 respectively.

"...That's a great idea, Starnes but in 10 seconds it's going to be obsolete..."

BCCC Artmobile

The Bucks County Community College ARTMOBILE, a mobile gallery that services the residents and school districts in Bucks County, Pa. is planning an exhibition on Computer Art and Music for the Fall Season of 1980. The exhibit will include hands-on interactive experience with computer terminals inside our van as well as an exhibition of state-of-the-art work in graphics and music via films, tapes and demos. We are still in need of graphic terminals, graphic peripherals such as digitizing pads, light pens, etc. and graphics related software at varying degrees of sophistication for our broad based audience. The ARTMOBILE is a non-profit organization and any hardware and/or software donated or loaned would be tax-exempt. The exhibit will tour the country for approximately four months, reaching an audience of 20,000 people. This is a very good opportunity to publicize all computer products to the school districts and business community in our county. We would also appreciate your support in our efforts to present computers as an accessible and comprehensible tool for artistic and imaginative expression. For further information please contact Martha Lubow, B.C.C.C. ARTMOBILE, Bucks County Community College, Swamp Road, Newtown, PA 18940 (215) 968-5861.

Computer Seminars

H. W. Computers is forming two new and instructive seminars dealing with the age of personal computing. Both seminars will be held regularly and are presented at no cost or obligation to the public.

The purpose is to provide a better understanding of personal computing by explaining how computers have developed over the years and the many ways they are used in everyday life today. The seminars include: a brief history of computers, how they operate, an explanation of computer terms, how we instruct computers to perform various tasks and a demonstration of applications and capabilities.

One seminar is dedicated to young people 12 to 18 years of age who have an interest in computers and who may, or may not, have access to computer courses in their local schools. The remaining seminar is for adults who intend to purchase a personal computer, or adults who wish to determine how personal computers can be of interest and benefit to them.

To register, stop by the retail store at 19511 Business Center Drive, Northridge, CA or phone (213) 886-9200 for registration information.

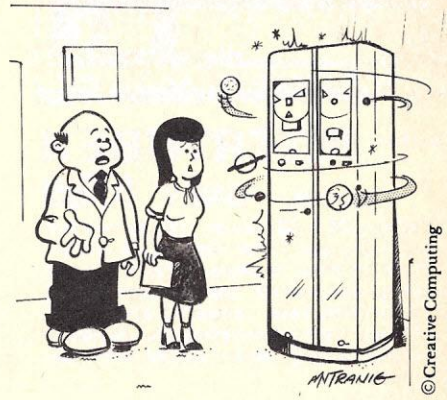
National Computer Association Formed

The National Computer Association (NCA) was formed by a steering committee of users from across the nation on April 25, 1980. The proliferation of computing products and associated applications has made it impossible to gain information about all the available products. System houses as well as end users need to communicate about such products through some central organization. As computing products become more numerous, this need for information exchange grows. The NCA will provide a quarterly publication to promote the exchange of ideas; an indexed catalogue of products available from other members to promote member-to-member communication about such products; and a forum for the presentation of information and exhibits in an annual meeting.

Membership is available at a cost of $35.00 on an annual basis. The first NCA News, available in July, will introduce some of the members and contain the finalized by-laws. The first indexed catalogue of available products will be published in the third quarter. The NCA 1980 meeting is scheduled to be held at Stouffer's Denver Inn on December 4 & 5, 1980. For more information, contact Floyd L. Burton, Director, NCA, 1485 E. Fremont Cir. S., Littleton, CO 80122 (303) 797-3559.

Computer Show

The Mid-Atlantic Business & Home Computer Show will be held at the D.C. Armory/Starplex, Washington, D.C., Thursday, September 18 to Sunday, September 21, 1980. Show hours are: Thurs.-Saturday, 11 a.m. to 9 p.m., Sunday, 11 a.m. to 6 p.m. General adult admission is $5. An end-user public exposition featuring small and medium-sized business systems, scientific and engineering computers, micro-computers and electrotechnology, produced by National Computer Shows, P.O. Box 678, Brookline, MA 02147. Tel: (617) 524-4547.



"Do you think this computer is starting to show strange tendencies?"

North Star Horizon–
COMPUTER WITH CLASS

The North Star Horizon computer can be found everywhere computers are used: business, engineering, home — even the classroom. Low cost, performance, reliability and software availability are the obvious reasons for Horizon's popularity. But, when a college bookstore orders our BASIC manuals, we know we have done the job from A to Z.

Don't take our word for it. Read what these instructors have to say about the North Star Horizon:

"We bought a Horizon not only for its reliability record, but also because the North Star diskette format is the industry standard for software exchange. The Horizon is the first computer we have bought that came on-line as soon as we plugged it in, and it has been running ever since!"

— Melvin Davidson, Western Washington University, Bellingham, Washington

"After I gave a ½ hour demonstration of the Horizon to our students, the sign-ups for next term's class in BASIC jumped from 18 to 72."

— Harold Nay, Pleasant Hill HS, Pleasant Hill, California

"With our Horizon we brought 130 kids from knowing nothing about computers to the point of writing their own Pascal programs. I also use it to keep track of over 900 student files, including a weekly updated report card and attendance figures."

— Armando Picciotto, Kennedy HS, Richmond, California

"The Horizon is the best computer I could find for my class. It has an almost unlimited amount of software to choose from. And the dual diskette drives mean that we don't have to waste valuable classroom time loading programs, as with computers using cassette drives."

— Gary Montante, Ygnacio Valley HS, Walnut Creek, Calif.

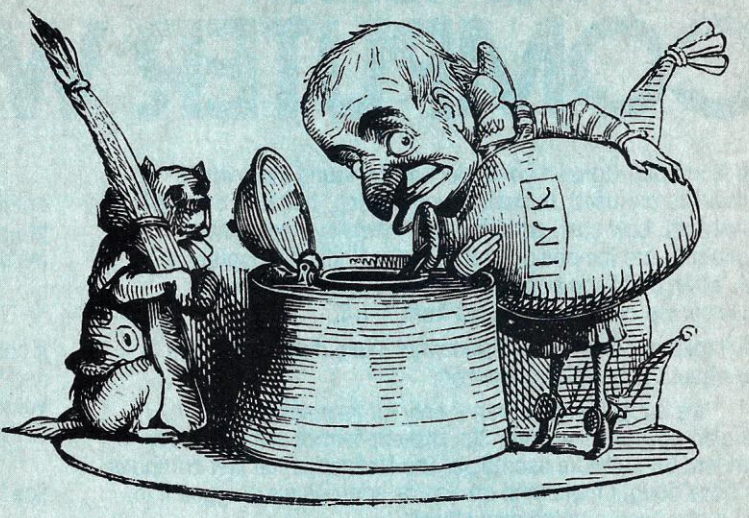
See the Horizon at your local North Star dealer.

CIRCLE 138 ON READER SERVICE CARD

NorthStar

North Star Computers, Inc.
1440 Fourth Street
Berkeley, Ca. 94710
(415) 527-6950 TWX/TELEX 910-366-7001

Input/ Output



Right Idea From Heath

Dear Editor:

Your readers may have gotten the wrong idea from Randy Heuer's article on The Heath WH-89 in the April issue. The assembled and tested version of the Heath WH-89 is also marketed through computer stores (and OEMs) as the Zenith Data Systems Z-89.

Mr. Heuer made several comments in his article which readers could erroneously accept as limitations of the '89. For example, the user need *not* be limited to only a single mini-disk. The user *is* limited to a total of three drives and HDOS currently supports only single-sided drives.

We supply standard CP/M™ for the '89. This requires a plug-in modification board (to re-map memory for RAM at 0) which we designed and sell. Under the CP/M we supply, the user may mix any combination of single- and double-sided drives. (We also have a 10 MByte hard-disk add-on.) The user can run CP/M applications packages which will run on 48K systems; this summer we expect to be able to up that to 64K.

Good screen-oriented editors such as Magic Wand and WordStar are available for the unit. The 48K unit with word-processing software costs approximately $3500. Adding a daisy-wheel printer brings the cost of a word-processing system to approximately $6500. This system would compare quite favorably to commercial word-processing systems costing twice this amount!

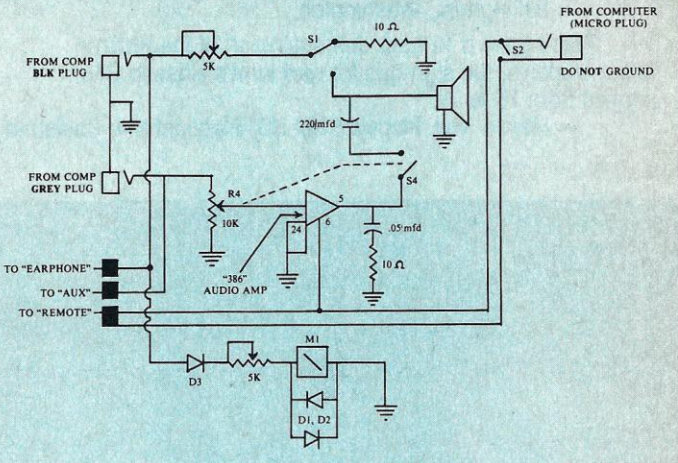
The '89 is not as limited as Mr. Heuer's article suggested.

Ms. K.L.C. Gjerding
Operations Manager
Magnolia Microsystems
2812 Thorndyke Ave. West
Seattle, WA 98199

Improvements to TRS-80 Data Monitoring Device

Dear Editor:

The combination level meter/speaker/recorder control capabilities provided by the design in the September '79 issue (Cassette Tape Monitor: Build It Yourself) was immediately attractive to me. I picked up all the parts at my local Radio Shack for under $25 and assembled the unit with no problems in about two hours. However, during assembly, I became suspicious of the proposed circuitry for the recorder control switch, so I looked into my recorder schematic a little further. On my CTR-80 recorder, if one were to switch the remote control hot conductor to ground, you would short out the B+ power and blow out your power supply diodes. This is easily fixed by isolating the micro-jack from the chassis. I drilled an oversized hole and epoxied in a sheet of heavy plastic in which I mounted the jack. Be sure to avoid any grounds through the switch!!



After using the unit quite satisfactorily for a few weeks, I realized that with a few minor modifications, you can use the unit as a sound-producing device for games, music, etc. By wiring in Radio Shack's 99¢ audio amp and a rheostat, you can produce fairly good sound through the 2" speaker! Now all three plugs on the cable connect into the unit and three extension leads connect to the recorder, making lead routing easier. Also, extend the recorder connector leads into the device to avoid needing three jacks and plugs. While it is not necessary, with the increased number of components, you might want to use a PC board for mounting. I recommend using mini-coax or shielded wire for the internal signal paths and the recorder cables. Note that to supply power to the amp, the recorder must be in "Play." This is usually the condition it will be in after a load anyway.

Additional Parts List	Radio Shack Part #
Audio Amp	276-1731
Socket for Amp	276-1995
10K Rheostat w/switch	271-215
220 mfd electrolytic	272-1029
.05 mfd cap	272-134
10 ohm resister	271-001

Roger P. Wells
1008 Kehoe Drive
Saint Charles, IL 60174

Add To Your "Shoplist"

Dear Editor:

The interesting uses to which personal computers are put appears [sic] to be unending. Your magazine is continually a source of information and ideas.

Do more than ever before- spend less than you planned

Heath makes the All-In-One Computer more versatile

Many satisfied customers know Heath takes the risk out of buying a balanced computer system. With the Heathkit All-In-One Computer, you get 16K Random Access Memory (expandable to 48K), keyboard, video terminal and floppy disk system – together in one self-contained, compact unit – for up to hundreds of dollars less than comparable systems.

Heath now makes the All-In-One Computer more versatile than ever! The new Heathkit H77 Floppy Disk System gives the All-In-One even more data storage and recall capacity. Combined, the All- In-One and H77 Floppy Disk give you up to 300K bytes of on-line data storage – enough to hold entire files. You can mount operating system and program disks at the same time, to make computing even faster.

You can run programs written in MICROSOFT™ BASIC™ and Assembly Languages, and all current software written for the popular Heathkit H8 Computer.

Heath User's Group (HUG) will share with you a library of over 500 programs to make your computer serve you in ways you never imagined.

There's no better way to learn about computer systems – and save money – than by building one yourself. Concise, easy-to-follow Heathkit assembly manuals show you the way, from start to finish. And a nationwide network of service centers protects your computer investment.

Join the Heathkit computer family today – and pocket the savings!

For complete details on Heathkit computer systems, as well as nearly 400 other electronic kits for your home, work or pleasure, send today for your free, value-packed Heathkit catalog. Or pick up your copy at the nearest Heathkit Electronic Center.

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VISIT YOUR HEATHKIT STORE

In the U.S. and Canada, visit your nearby Heathkit Electronic Center where Heathkit products are also displayed, sold and serviced. See the white pages of your phone book. In the U.S., Heathkit Electronic Centers are units of Veritechnology Electronics Corporation.

CP-184

CIRCLE 146 ON READER SERVICE CARD

I/O, cont'd...

I felt compelled to write after reading James McClure's article "Shoplist: The Latest Kitchen Utensil" in your May 1980 issue. The benefits of a system such as Mr. McClure's can be appreciated by many of us who suddenly find we've been handed the responsibility of doing the weekly shopping, without any idea of what is needed.

I would suggest the next logical step in this system would be assigning each item on the file a location code corresponding to the item and location in the store. This presumes most shopping occurs at one favorite shopping center. By sorting the items on this code (think of it as a "bin location" in a warehousing operation) before printing, the list the trip up and down the aisles can be facilitated to a faster conclusion. Such codes could be based only on aisle number; or side (left or right); or tier; or a grid pattern. After all, a grocery store is very much a public warehouse operation in which we are the bin-pickers. And I for one don't want to spend any more time than necessary winding my cart through the aisles.

Keep up the good, and interesting, work!

Dave Kennebeck
1103 Morningside
Round Lake Beach, IL 60073

Computer Criminals Exonerated

Dear Editor:

This letter pertains to certain gross inaccuracies in "How Safe Is Your Computer?" May '80, page 32. The inaccuracies pertain to that portion of the article referring to the loss by Penn Central Railroad of 217 boxcars.

For the past three years I have personally investigated the allegations set forth in your article and have found no evidence to support them. It is true that in 1971 newspaper articles appeared, indicating that the Penn Central Railroad had lost certain boxcars, possibly as a result of computer error. Subsequent investigation demonstrates, however, that the newspaper articles had no foundation in fact. To repeat these allegations nine years later constitutes a gross libel of the "tiny railroad" as well as the individuals connected with its operation at that time. While your article does not mention the names of those persons, or the name of the "tiny railroad," people in the railroad industry are well aware of the reference.

The true facts surrounding this mater reveal that the Penn Central computers were not to blame at all and, as a matter of fact, nobody had even modified any computer input. Transcripts of the testimony taken in the Penn Central bankruptcy hearing as well as other documents reveal the following:

a. Equitable Life Assurance Society had leased 4000 boxcars to Penn Central. These boxcars were manufactured by Pullman Standard and all were of the same type and vintage.

b. In 1971, Equitable sold 466 boxcars to an individual in New Jersey who then entered into an agreement with a short line railroad in LaSalle, Illinois to recondition the boxcars and eventually place them into service.

c. The boxcars in question, however, were spread throughout the country because many of them were in service in the U.S. railroad complex, and many months went by without Penn Central's delivering the boxcars to the rightful owner. In addition, even though Penn Central was not the rightful owner of the boxcars, it continued to collect fees from other railroads for their utilization.

d. Due to the negligence of Penn Central employees, boxcars of the same vintage as purchased, but bearing different serial numbers, were shipped to the Illinois railroad.

e. The owner immediately notified Penn Central that it was sending the wrong boxcars; Penn Central replied that the owner should accept those boxcars since they were of the same manufacture and vintage, even though the serial numbers were different.

f. There was no computer error. No computer input was ever modified but instead, officials of Penn Central Railroad directed that the boxcars be sent to the short line railroad in Illinois.

g. Most of the boxcars were not classified as scrap; to the contrary, most had a minimum of five to six years of useful life left and, if reconditioned, could continue to be utilized for an additional twenty-five to forty years.

h. None of the boxcars shipped to Illinois had any product in it and therefore could not be emptied. There were no contents to dispose of.

i. Many of the boxcars were reconditioned and since their ownership had changed, Penn Central's name was deleted and the name of the new railroad was affixed.

j. None of the individuals involved had any connection with organized crime, contrary to the allegation in your article.

As can be seen from these facts, all of which are supported by transcripts of testimony and documents, no boxcars were ever scrapped, none was ever emptied and its contents disposed of, and none of the individuals had any connection with organized crime. As previously stated, the individuals connected with this transaction are well known in the railroad industry. Anyone reading this article would immediately associate the situation with those individuals. Thus, the failure to name them in the article does not excuse the libel. This article, nine years after the fact, falsely accuses these persons of being related to organized crime and committing the theft of 217 Penn Central boxcars.

It is a shame that you have had to use this regrettable situation as an example of alleged computer crime. I am sure that you can come up with much better examples without blaming the computers.

I urge that in your next issue, you print a retraction of the allegations so that the reputation of the individuals will not be further harmed.

Warren J. Kaps
Court House Towers
39 Hudson Street
Hackensack, NJ 07601

We are deeply grateful for this chance to rectify any error that may have appeared, and sincerely hope that those concerned readers who have, by their letters, phone calls and telegrams, expressed dismay and distress on these matters, will at last rest easier. — *Ed.*

Information On Sharing For All, Please

Dear Editor:

In the Input/Output section of the June 1980 issue there is a letter about sharing a disk and printer with a dozen Pets. I would like to find out if such an arrangement is possible with other small computers, for instance Apples, or TRS-80's. Perhaps some of your other readers have such knowledge they could share.

Nat Mann
St. Williams Public School
1391 Main Street
Tewksbury, MA 01876

Accurate Accuracy

Dear Editor:

After having had some trouble converting Bruce Barnett's "Accuracy Plus: Multiprecision Multiplication" *(Creative Computing,* August, 1979) — the product on page 82, 1st column, top, is incorrect from place 22 to 45 — I took up the suggestion of your reader Doug Jones ("Accuracy [?] Plus," Input/Output, *Creative Computing,* December, 1979) to check by dividing the product.

For the benefit of those of your readers who have had the same trouble working it out with Pencil and Paper, I'm enclosing the checked results of the multiplications on pages 82 (top) and 83 (bottom). They are correct unless bugs in two independent programs have formed a conspiracy.

```
152415787745770472380?3 x 962858720375106022735947 =
146754870353856322393787291429533041593241101?1


146754870353856322393787291429533041593241101?1 / 962858720375106022735947 =
152415787745770472380?3
( ENDET NACH 0 DEZIMALSTELLEN. )


398133358946552076341 x 7565710886037285354?7 =
3012161887876519079394407344498067855057?7

3012161887876519079394407344498067855057?7 / 7565710886037285354?7 =
398133358946552076341
( ENDET NACH 0 DEZIMALSTELLEN. )
```

Peter Jankowski
Alarich Strasse 1
5000 Cologne 21
West Germany

MicroNET is just the tip of the iceberg

We've been telling you that MicroNET, CompuServe's personal computing service, is the best thing that's happened to personal computers since electricity. It still is, but now there's more. A lot more.

Welcome to CompuServe's information service.

- *News. Weather. Sports.* Major regional newspapers. Plus international news services.
- *Finance.* MicroQuote. Updates and historical information on stocks, bonds and commodities.
- *Entertainment.* Theatre, book, movie and restaurant reviews. Plus opera, symphony, ballet, dance, museums, galleries...
- *Electronic Mail.* Create, edit, send and receive messages from any other CompuServe user...nationwide.
- *Home & Educational Reference Service.* Anything you want to know...from encyclopedia information to household tips.
- *CompuServe user information.* In case you need technical help...and information on new services as they become available.
- *MicroNET.* All we've offered before and added lately with more to come. This includes Software Exchange,line printer art gallery, challenging games, programming languages, word processing, business & educational programs...and much, much more.

So we're raising the price. Right?

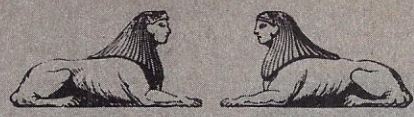
Wrong! All you pay is a small hook-up charge, and $5.00 per hour billed in minutes to your charge card. You need a 300 baud modem and we're a local phone call in more than 200 North American cities.

Write for information. This is almost too good to believe, but we're delivering as promised.

CompuServe

Information Service Division
5000 Arlington Centre Blvd.
Columbus, Ohio 43220
(614) 457-8600

CIRCLE 121 ON READER SERVICE CARD



Let's Document Our Statements

Dear Editor:

I read with interest the article "Computer Aided Sight Reading" by Clark, Wilkins, and Tuma. I have been using a similar program on the TRS-80 for some time. My program provides several added features: All machine language graphics, a tone generator subroutine that outputs the various intervals (great for sight singing practice), and light pen input routines so the student need have minimal familiarity with the system to operate it.

My real gripe with this article is that statement that "classroom results have verified that beginning students are progressing much faster than usual in learning this basic skill." Exactly what is meant by faster? What is the usual rate of progress? Was there a pretest-postest procedure? What kind of data were used to make this statement? Was there a control group? Were the results statistically significant?

I realize the nature of *Creative Computing* magazine and its interest to present software of the type presented in this article. But the editors should realize that authors making conclusions about the effectiveness of this software without statistical evidence are performing a disservice to the field. It is very important as we implement new technology in the classroom that we refrain from making global statements of the value of this technology with no experimental evidence to confirm it! We will fail in trying to convince administrators to shell out thousands of dollars if we cannot show hard evidence that computers *do* really aid in instruction. The more carefully designed studies completed in the area, the better. Perhaps *Creative Computing* can publish a series of articles which show such evidence that computer aided instruction is "better" (?) than traditional approaches.

Maybe the authors of the article on "Computer Aided Sight Reading" have completed a carefully designed study to confirm the value of their program (I am currently working on a study to confirm the value of my program). Great! Let us have the results, otherwise, silence is better than statements made without evidence.

Roger A. Kendall
Dept. of Music
Wentworth Military Academy and Jr. College
Lexington, MO 64067

We stand by our authors. The statement in the article counts as anecdotally acceptable; this is not a statistics journal. But if you have counterevidence, we'll run it. — *Ed.*

Simplified Word Board

Dear Editor:

The article, 'The Word Board,' by Howard Berenbon (April 1980) described an interesting concept. However, the program given is more complex than it need be. My version, enclosed, is based on treating the KEY as the independent variable and the English-French word pairs as the dependent variable in an alpha-numeric function.

The Basic used is that of the Wang 2200, but the program should require few changes to work on other machines.

```
10 PRINT "SIMPLIFIED PROGRAM FOR 'WORD BOARD'."
20 PRINT "BY EMORY LAKATOS, 6/3/80"
30 PRINT "SEE: 'The Word Board' by Howard Berenbon, Creative Computing, Apr
il, 1980"
100 INPUT "WHAT KEY",A1$
110 READ A$,B$
120 IF A$<>A1$ THEN 110
130 PRINT B$
140 RESTORE
150 DATA "A","APPLE  POMME","B","AIRPLANE AVION","C","CUP TASSE","D","COW V
ACHE","E","COAT  VESTON","F","DOG  CHIEN","G","HAND  MAIN","H","SUN  SOLEIL
","I","BOOK  LIVRE"
160 DATA "J","MOON  LUNE","K","EAR  OREILLE","L","CLOUD  NUAGE","M","COMB
PEIGNE","N","EYES  YEUX","O","ICE GLACE","P","STAR  ETOILE","Q","SPOON  CUI
LLERE","R","CHAIR  CHAISE"
170 DATA "S","HORSE  CHEVAL","T","PENCIL  CRAYON","U","LAMP  LAMPE","V", "B
IRD  OISEAU","W","FISH  POISSON","X","BICYCLE  VELO","Y","CAT  CHAT","Z","H
AT  CHAPEAU"
180 DATA "1","ONE  UN","2","TWO  DEUX","3","THREE  TROIS","4","FOUR  QUATRE
","5","FIVE  CINQ","6","SIX  SIX","7","SEVEN  SEPT","8","EIGHT  HUIT","9","
NINE  NEUF","0","ZERO  ZERO"
```

Emory Lakatos
404 9th Street
Santa Monica, CA 90402

Which Question To Ask?

Dear Editor:

First, a comment: I've noticed a steady upgrade in the quality of your editorial content; please keep it up.

Second, a question: With more computer stores appearing on the scene, buyers and browsers find that knowledgeable people are not always available in showrooms to answer questions. I, and perhaps others of your readers, could benefit if we had some "vestpocket tests" that could be keyed into equipment on display so that the buyer might determine if the equipment were "Z80," "Z80A," "8080," "6800," "6502," (or whatever) based. Can your capable staff, or one of your knowledgeable readers help in this regard?

Richard A. Carr
3015 Lindberg Avenue
Allentown, PA 18103

It's a nice idea — but if you don't know what chip is in the machine, how do you expect to get a low-level test past the unknown ROM?

Actually, we at Creative *think it matters less and less what chip is inside, and more and more what your software environment is. If you have to ask what chip is in the computer, perhaps you're asking the wrong question.* — *Ed.*

Corrections For Apple Strings

Dear Editor:

Rick Geiger states in his article "Apple Strings" that "more checking is necessary to ensure that we have located the right variable." I have found this not to be the case.

When a statement such as X$=X$ is executed, the two position name is changed from X$ to a coded representation of that name and stored in $81 and $82. Following is a description of what Applesoft does to these variable names.

The high-order or sign bit is not used in the ASCII format. Applesoft makes use of this fact to save space. Each variable uses two positions for the name. For an integer variable the high-order bit in both positions is set on, for a string variable the high-order bit in the second position only is set on, and for a real variable neither high-order bit is set on. Listed below is a table of names and the coded representation for each.

Used in Basic	Coded Name (in hex)
X%	D8 80
XX%	D8 D8
X	58 00
XX	58 58
X$	58 80
XX$	58 D8

This coded name is also the name used in the variable table. When a match is found between the name in $81 and $82 and the variable table, no further checking is necessary, as the variable type is actually built right into the name. Mr. Geiger could leave out lines 460-540 in his program with no ill effect.

I enjoy your magazine very much.

James B. Webb
4629 Newbern Heights Drive
Pulaski, VA 24301

Dear Editor:

I have just finished reading "Apple Strings" by Rick Geiger in the May '80 issue of *Creative Computing*. I just cannot resist responding to the article: it demonstrates what a person can do with Applesoft Basic using just a little ingenuity and imagination. I have been using an Apple II for about a year and a half now and have also written a number of programs which use assembly-language routines to enhance Basic's operations and execution speed. I have encountered the problem of parameter-passing in Applesoft and have some comments and observations to share.

One of my first approaches to the problem was very similar to Rick's. He uses the fact that Applesoft keeps the name of its last-used variable in page-zero locations $81 and $82. He then proceeds to use this name to re-look up the variable in Applesoft's simple variable tables. Unfortunately, Rick is reinventing the wheel: Applesoft already keeps a pointer to the last-used variable in locations $83 and $84. This pointer points at the third byte of the variable descriptor (for string variables,

A NEW WORLD OF SMALL COMPUTERS IS AT YOUR FINGERTIPS THIS FALL

4th Annual

NATIONAL SMALL COMPUTER SHOW

New York Coliseum, October 30 to Nov. 1, 1980

When we say "fingertips" we mean just that: a hands-on-inspection opportunity for you to try the small computers and systems that will write the history of microprocessing in the 1980's.

Manufacturers will fill over 30,000 square feet with computers, software and peripherals. Amazing strides in technology are reflected in exhibits and lecture series.

New hardware and software for business, education, the sciences and professions, graphics and personal use are being gathered for the largest and most beautifully presented National Small Computer Show ever produced.

As always, the show contains attractions for the seasoned computer professional, as well as those who wish an introduction to the exciting world of small computers for business, professional or personal use. In just a short time, you can discuss your interest with many industry leaders, vendors, technologists, and our expert lecturers.

Registration fee is only $10 per day, and all registrants have free access to the hourly lectures.

FREE LECTURES FOR VISITORS

Introduction to Small Systems for Business, Stan Veit, Associated Computer Ind., noon, Oct. 30 & 31.
Mailing Lists: Several Directions, Dr. Norman Agin, Mathtech, Inc., noon, Oct. 30 & 2 pm, Oct. 31.
Selecting A Small Computer for Business, David Benevy, Computer Mart of NJ, 1 pm, Oct. 30 & 31.
Evaluating and Improving Your Computer's Performance, Philip Grossman, Raytheon Co., 1 pm, Oct. 30.
Law Office Systems Aspects of Word Processing, Bernard Sternin, 2 pm, Oct. 30.
Future Smart Machines: 2000 A.D. and Beyond, Dr. Earl Joseph, Sperry Univac, 2pm, Oct. 30.
Computer Contracts - Facing the Issues, Alan C. Verbit, Verbit & Co., 3 pm, Oct. 30.
Acc'ts Receivable/Acc'ts Payable/Gen'l Ledger, 3pm, Oct. 30.
Advantages of Distributed Processing & Multi-Processing, John Steefel, QI Corp., 4 pm, Oct. 31.
Investment Analysis of Stocks & Commodities on a Microcomputer, Fred Cohen, Shearson Loeb Rhodes, Inc., 4 pm, Oct. 30, 3 pm, Oct. 31.
BASIC Programming, Michael Mulcahey, Worcester State College, noon, Oct.31.
Videoprints: Full-Color, Low-Cost, Hard-Copy Computer Graphics, Warren Sullivan, Image Resource Corp.,1pm, Oct. 31.
Business Applications Software Development Via Data Base Management, Dr. Andrew Whinston, Micro Data Base Systems, 2 pm, Oct. 31.
Application of PASCAL to Small Systems for Business, Panel, Stan Veit, Associated Computer Ind., Moderator, 3 pm, Oct. 31.
Educational Software: the Good, the Bad, the Ugly, Jo Ann Comito, S.U.N.Y. at Stony Brook, noon, Nov. 1.
Introduction to Personal Computing, noon, Nov. 1.
Computer-Assisted Mathematics Courses, Dr. Frank Scalzo, Queensborough Community College, 1 pm, Nov. 1.
Artificial Intelligence Update, Prof. Peter Kugel, Boston College, 1 pm, Nov. 1.
Compiling and Retrieving Personal Medical Data with a Microcomputer, Derek Enlander, MD, St. Luke's Hospital, 2 pm, Nov. 1.
The Present State of CP/M Compatible Software, Tony Gold, Lifeboat Associates, 2 pm, Nov. 1.
High Volume Data Handling: Intro. to File Processing, Prof. Peter Kugel, Boston College, 3 pm, Nov. 1.
Connecting the Computer to the Outside World, Prof. James Gips, Boston College, 3 pm, Nov. 1.
Educational Applications in the Home, David Ahl, Creative Computing Magazine, 4 pm, Nov. 1.
Household Applications - Some of Them New, Dr. Dennis J. McGuire, 4 pm, Nov. 1.

(Additional lectures to be announced)

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I/O, cont'd...

the length byte).

Using this pointer has several advantages. It is immediately available for use with the 6502's indexed-y addressing mode. The pointer will be correct even if it is the Basic program's first reference to that variable. The pointer is also valid for use with array elements, using the following call sequence: B$(0)=B$(0) : CALL (routine address). With this example the $83-$84 pointer will point at the descriptor to B$(0). Descriptors for B$(1), B$(2), etc., will follow immediately after.

The one major restriction to this technique is that only one pointer to a parameter can be passed per call. Multiple parameters would require multiple calls, each of which would store a pointer to a parameter. This is further complicated by the fact that the array variable table moves upwards in memory as new simple variables are added to the simple variable table. Pointers to array elements may not be valid during later calls from Basic!

In cases requiring multiple parameter passing, I have often preferred the "first-defined" technique. This technique does not restrict us to using just one parameter variable, as Rick suggests. Indeed, we can access any number of variables within the variable tables, as long as we know their exact order and position within the tables. This is managed by having Basic refer to the parameter variables in the order they are expected to be seen in the variable table, before any access, use, or definition of any other variables. One program I have written uses the following to define three integer type and one string type variable: V1%=0 : V2%=0 : V3%=0 : V4$="". The Applesoft simple variable table pointer at $69 and $6A points to the very beginning of the variable table. Entries for each variable are seven bytes apart, a fact which Rick used in his GET ADDRESS routine. One may simply use indexed-Y addressing to look up the values of any of the variables (or pointers in the case of string variables). A word of caution: integer values are stored by Applesoft high-byte first as opposed to the normal low-byte first 6502 convention.

I have not found the sign (#7) bits on variable names which designate variable types to be unreliable, as Rick has. This may be explained by an error in the Applesoft II Reference Manual. String variable names are denoted by a positive first byte and a negative second byte. *This is described in reverse within the manual.*

One area of variable passing which should not be overlooked is Applesoft's ampersand (&) instruction. The "&" instruction is equivalent to a call to location $3F5. Its nice feature is that it may pass variable names, string data, constants, or any other information to the assembly language subroutine (usually, $3F5 contains a JMP to the actual routine). I have recently used "&" to create a 'wildcard' string compare function. A Basic statement which might use the function would look like: & A$,NA$(X),M%. The first variable contains a string with possible imbedded wildcards (*'s) and the second contains a string for comparison (note the ability to use array elements). The last variable, an integer, returns a value of '0' if the match did not succeed, and '1' if it did succeed. Applesoft's own internal subroutines were used by my subroutine to look up the pointers to the variable tables.

This is getting rather long. I will stop here and thank you and your submitters for the excellent work you are doing. Keep it up.

Guy A. Lyle
500 Andrew Lane
Lake Zurich, IL 60047

Correction on TMI

Dear Editor:

I was gratified to see my review article in print in your March 1980 issue, but a correction is in order.

In the article I stated that the color convention used in the MUSE Three Mile Island program for valve and equipment status was the same as that used in a real power plant. Actually, the program has it exactly reversed. A red status light represents a running pump or an open valve. The rationale is that green means a safe condition (closed valve, idle pump), and red represents potential trouble if something is not lined up correctly.

Victor R. Fricke
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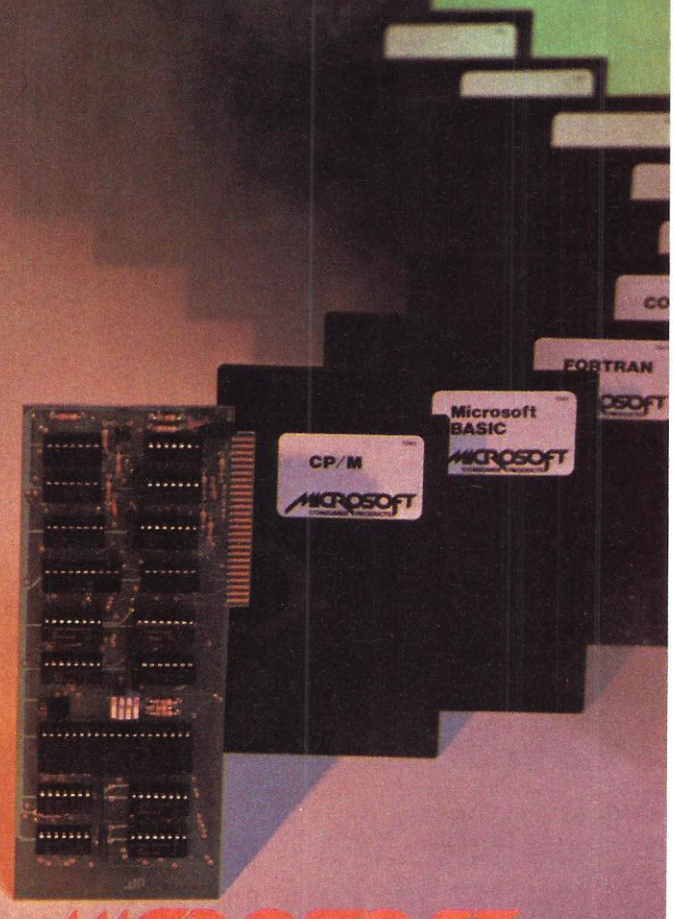

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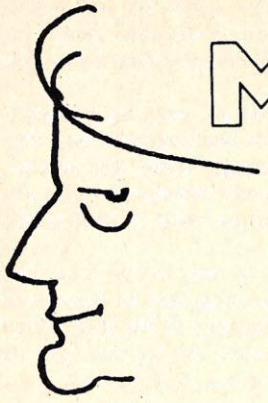

Missionary Position

Ted Nelson

The 1980 NCC

The 1980 National Computer Conference, in Anaheim next to Disneyland, was only moderately interesting. Five major exhibit arenas (one officially deemed to be "personal") held rather little that was new.

The Bombshell

The most important event of the National Computer conference was the Great Ethernet Announcement. You will recall (see "Random Ramblings" in our June 1980 issue — hereinafter cited as June RR—) that Ethernet is a system of coaxial-cable interconnection intended for computers and other office equipment. A single Ethernet cable, running through a maze of offices, will permit documents and data to zitch back and forth instantly between all the typewriters and printers and keyscopes and computers and wall-projectors and copiers and document storage boxes, all faster than you can say "Xerox Palo Alto Research Center," where it was invented.

The Great Ethernet Announcement was the joint disclosure by Digital Equipment Corporation and Intel that they would join Xerox in this venture; and Xerox's complaisant disclosure that it would welcome them in.

KABOOM!

Ladies and gentlemen, it is now established that the Office of the Future — or OOF, as I like to call it -— will have one standardized system of interconnection. And we now know its name. Ethernet.

In the computer industry, things have a funny way of becoming standard. They become standard because they develop momentum. Some events contribute importantly — like an IBM announcement or a Standards Committee definition — but these *contribute* to momentum, they don't guarantee it. So when a particular company brings out a product, like the Altair computer or 3M's Data Cartridge, there is a big question whether it will become standard. (The Altair's system of interconnection, now called the S-100 bus, did become standard; the data cartridge did not, though it's still around and decent. And if you think IBM's stuff automatically becomes standard, just think of the sprocketed 16mm magnetic tape that came on IBM's old MT/ST typewriter. Where is it now?)

Prateep Amornvitikivacha next to his first place project, a Thai-English CRT and Printer (TTY'43), in the Personal Computing Festival.

Xerox knew they were taking a chance going it alone with the Ethernet; however, that meant if it caught on they'd have it all to themselves. But then they were approached by DEC and Intel, separately, and saw the wisdom of sharing the system — for less than all of a much bigger pie.

This also probably means that the field will be open up for other companies who want to supply special boxes to the Ethernet — because three big corporations make a coalition, and there are some very specific laws about that sort of thing, heh heh. So the Ethernet will probably be a very good thing for everyone — other vendors, users, and the whole wide world.

Speaking of coaxial, Zilog showed at its booth a very nifty new set of boxes — a complete office communication setup based on their Z80 chip, all interconnected by a video cable and set up to toss messages and data back and forth. Looked great. However, given the importance of the Ethernet coalition, Zilog is placed in a very difficult position. Should they go on pushing their own cable setup, just announced, or retrench to join the Ethernet crowd, even alongside their rival Intel? I predict they'll have to give in and join Ethernet — but they won't like it, and it could take six months or more of corporate infighting.

"Personal" vs "Industry" Shows At NCC

Originally, when Portia Isaacson managed to get personal computing accepted as a section of the National Computer Conference, it looked like a big breakthrough. Now it's settled down, though, and the outcome can be seen in negative ways as well.

The personal computing conference is a way of taking the heat off — keeping low-priced competition away from the main exhibit area. Furthermore, not opening it till Tuesday of the show ensures that conferees see all the high-priced goods first.

(Just consider the Exidy Sorcerer as an example: at about $1300, it's an excellent terminal that can also be used as a computer; thus it competes with IBM's ASCII terminal, or should. But it was very far from the IBM booth.)

There's no real point in distinguishing the two exhibits. A computer is a computer. So here goes:

Apple The Third

Apple was not in the personal arena, but the Professional. Though they were tucked away in the farthest corner of the most obscure basement area, the free Disneyland tickets they were giving away assured their attention from many conference-goers.

And the Apple III was there. Yes, it's out. And trying to figure out what it means is fascinating.

In appearance the Apple III strikes me as unbeautiful — rather like an Apple II that has bumped its head. And the cost of the Apple III will turn your hair: $4000 plus. But that includes upper and lower case, 80 column display, a single mini-floppy drive and a clock/calendar accessories that would raise an Apple II to the Apple III price anyhow.

The ever-growing success of the Apple II makes it a tough act to follow; and Apple did so many things right on the Two, breaths are being held to see if they can possibly be as right on this one.

Surprisingly, they chose the 6502 chip, an eight-bit unit that is scarcely state-of-the-art. And they say, straightfaced, that this machine can address up to 128 K bytes. Yeah, but how many can it address *really*?

Part of the fun of the computer world is this kind of an announcement. Back in the 1940s, the strategy boys at RAND

Position, cont'd...

used to call this a Minsk-Pinsk, based on the following story: Two Russians meet on a train. First Russian: "Where are you going?" Second Russian: "To Minsk." First Russian: "Aha. Now I know that when you say you are going to Minsk, you want me to think you are really going to Pinsk. But I happen to know that you *are* going to Minsk. Why are you lying to me?"

So when the Apple fellas say, with a big grin, Yup, the Apple III can address up to 128K of memory, *you* think, Aha, it can *really* probably address a jillion megabytes, but they won't reveal that until *later*. And the Apple guys grin. What if it turned out that it only *can* address 128 K? Did they say different?

Anyhow, we know this machine has serious muscle, because they tell us that separate 6502 programs can be brought in in any order and automatically read-dressed. Now let's think together on this.

Relaxing outside Anaheim Convention Center.

That would seem to mean a separate hard-wired relocation register for each program, which is a very serious facility. Because that means you can really scramble those old addresses around something fierce, and the hardware will take care of it all. Rather like the DAT box (Direct Address Translation) that lets programs live together in the *big* machines.

Now, they don't seriously expect us to believe that these relocation registers are only eight bits long, do they? (Well, the infuriating thing is, they *might* be eight bits, but then we don't ordinarily expect Apple to do things wrong, and it only stands to reason that these registers oughta be sixteen bits each.

Now, I'm not saying that's how it is, I'm just saying that's what *stands to reason.*

Of course, it is conceivable that Apple decided, instead of putting their logic smarts into the big address space, to put them into a dinky little relocation capability, and organize their software around that. Then later on the Apple IV, for thousands of dollars yet *again,* could expand the address space.

But what the relocation hardware would also strongly suggest is a whole new line of interlocking binary software modules. (How this will relate to their considerable Pascal commitment is not clear.) And a big question is of course: will they cooperate with outside vendors, or try to go it alone?

Now here we'd better look at history. Apple has always had an elegant strategy with respect to cooperating vendors. It has been Apple's practice since the beginning to watch and work with cooperating vendors, and embrace high-class products into their own official line, with dealership access and all that.

This has happened with Microsoft Basic, which was rechristened "Applesoft," with Mountain Hardware products, with the D.C. Hayes modem, and so on and on.

Now we begin again. Here with the Apple III comes VisiCalc from Personal Software, all embraced into the official product. Does that suggest Apple will try to keep other software vendors out? No. They're much too smart. So I think that given Apple's historic posture, it is almost certain they will be cooperative about their grand software plan and the interface specifications. Thus small software vendors will probably be able to get into this market, given keen attention to Apple's signals and software releases.

Of course, this also means that the Apple III now creates a clear-cut Umbrella for independent software offerings for the Apple II.

For those of you who tuned in late, an important feature of the nineteen-sixties was the so-called IBM Price Umbrella — which has now largely folded.

This was the excessive price charged by IBM for a given type of product, above and beyond what other companies might happily make and sell that product for.

It was a fair bargain. In return for the legendary reliability of IBM's hardware, and their johnny-on-the-spot repairman armies, and just that IBM label that some people go for, you were paying extra. But this also was a gift situation for the other manufacturers, folks like Control Data and Univac and Memorex, who could do nicely selling compatible products for less, cowbirds around the behemoth.

And this also protected IBM, somewhat, against the charges of Monopoly, since it kept a menagerie of competitors essentially as pets.

So now here is Apple Computer. Originally (Year 2 Anno Altair) it was a struggling company like all us other struggling companies.

Now we see it more clearly as the jolly tan giant of personal computing, rising head and shoulders above the others, with a true personal computer, not just a box of boards with an unforgiving operating system.

And now Apple has the nerve to issue its new model at about twice the price of the old, with what looks so far like *moderately* more capability: the price umbrella again.

So, heh, heh, this means that for those of you who want to do software and accessories that crank up the Apple II to compete with the Apple III, it's open season.

And Apple will only smile.

I am personally tempted to do a word processor.

Now we see why, incidentally, lower case has not been adopted into the Apple II line, though there are several independent vendor accessories that do it.

But Apple chose to hold it all till the Model III.

That, to me, is the one naughtily ibmological thing they've done — holding back the capacity of the small machine to push you onto the big one, just the way IBM always has. Tut, tut, tut.

The Other Exhibits

Everywhere was the screech of new dot-matrix printers: from the top-of-the-line Facit, which offered two colors and considerable speed, down to the Base 2 in the personal exhibit area, which at $700 *with graphics* looks like a real winner — if it's reliable, etc. etc.

The most important event of the National Computer Conference was the Great Ethernet Announcement.

General Electric's new Terminet printing terminal is a beauty: physically, it is the best-looking teleprinter anybody's made. The color is also a surprise: refrigerator white. It's Option City, with keypads, speeds and buffers to your liking; in the $1500 range and up, they are obviously zeroing in on the range occupied by the Teletype Model 43 ("bulletproof" reliable) and the DEC LA34.

Yes, Virginia, you *can* get a functioning 68000-based computer. (The chipmonks all know that if it's CPU design you care about, the 68000 processor-on-a-chip is the best.) The boxed version is from Motorola, and you'll pay for it — $20,000 and up.

The Onyx Z8000 was there, and running Unix!

Yes, friends, the legendary UNIX time-sharing system may now be had, the whole ball of wax, for under $20,000 and serving eight users! Heaven and earth have met. And it was running, of all places, in the Microsoft booth in the Personal exhibit area. (Microsoft's Z80 card for The Apple, however, was not. Yet.)

The Findex computer, at $6000 and up, offers good news and bad. The good news is its portability (30-odd pounds with a handle), and up to two megabytes of on-board bubble memory. The bad news is that you access this through CPM, so that it can't all be treated as a big data space.

Winchester Backup was an important undercurrent of the exhibits.

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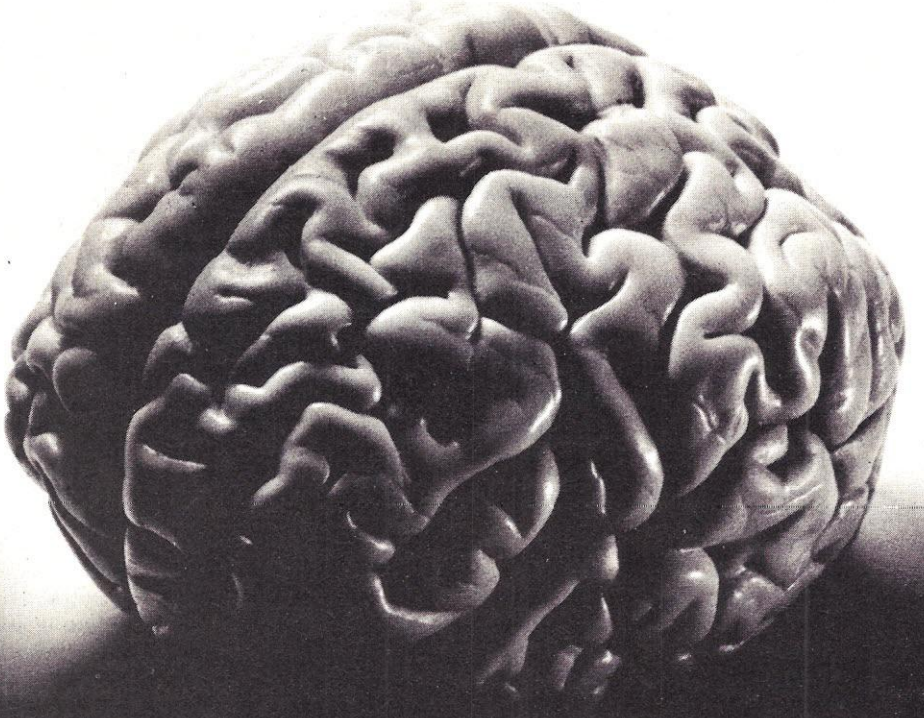

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Position, cont'd...

The question is, now that people are getting hard (Winchester) disks that hold millions and millions of bytes, *what if they crash?* Where to copy the information just in case?

Well, Konan Corporation — no kin to the barbarian — says it should be 3M data cartridges, and they'll hook 'em up to your S-100 under CPM. And others say it should be industry-standard 3/4″ mag tape, offering "streaming" tape drives for the purpose — that is, the tape keeps going in one direction, not jigging back and forth in vacuum columns. Some say floppy disks will bridge the gap. Corvus offers their videotape-cartridge system, the Mirror (see RR, June). But it really doesn't matter. The important thing to note is that the Winchesters really are getting out there. And that is a beautiful and happy development.

The Corvus Constellation (See RR, June), was running, too. The software seemed to be a little rocky, and Software Pipes were not up yet, but at least we saw it do stuff.

Pascal Boards for both the S-100 bus and Q-bus were seen. (This may standardize Western Digital's P-code.)

Aydin Controls showed just enough computer animation at their booth to suggest that they might be offering animation packages in the future.

(As yet, no commercial digital computer animation packages exist — except scattered pieces of software and a few TV services. COME ON, you guys!)

The Sandwich Boys from American Used Computer, a merry fixture for a decade with signs on their backs, were gone, banished inside by the stuffy and pompous Convention Fathers. Boo.

International Big Mother showed again their Document Box (see June RR). Of special interest to personal-computer fans was an ASCII terminal, portable, looking good and coming in at the rather threatening price of *$1300.* That's heavy. ASCII is the code of the personal computer field, and $1300 is only 40% more, say, than most. Also at the IBM booth were very nice *color* terminals. IBM terminal for your S-100 anyone? ASCII? No way, said the product mangler soothingly. They only work with the weird 370 protocol (in an optional complicated update, natch), and the price is given in dollars per month. Now that's the old IBM.

Most impressive exhibit among the personal amateur exhibits was a printed and CRT display of the Thai language — a lovely-looking loopy notation. Its developers actually had a teletype 43 handling the Thai characters under graphic control of a character generator. When I asked if they'd sell the Teletype graphics adapter, they only sighed modestly and said it was nothing.

A color-camera box for a reasonable price — $2000 — is out: "Videoprint" from Image Resource (Westlage Village, CA).

This is essentially a setup for shooting sharp color pictures of what would otherwise be fuzzy color displays. The reason is this: your color picture tube beams through a metal mesh, or, in the Trinitron, frizzes into a gridwork of tiny color-phosphor strips. While to the on-line user it's okay, this introduces by its very nature considerably more blur than you want to look at in a photograph.

The solution is to use the black-and-white monitor, whose phosphor is creamy smooth and untextured, to make three separate images for the primary colors, and then recombine these sharper images. (This is what is done in the big-screen TVs — Advent, Panasonic, and others.) For making photographs, however, all you need is a single black-and-white monitor, sauced with your primary colored filters. You put a camera in this box, see, with color film, and open the shutter. Now the

The Creative Computing booth at NCC was shut down briefly due to a row with AFIPS management. For details, keep tuned.

monitor shows the *red* part of the picture through a *red* filter. After which darkness descends, and the color-wheel turns, and the monitor shows the *blue* part of the image through the *blue* filter. And once more the wheel turns, and the *green* part of the image appears on the monitor, and this view is appropriately tinted through the *green* filter. (I remind you that when you are combining images optically, the primary colors are red-blue-green — unlike what it was like in art class, where you mixed poster paints and the primary colors were red-blue-yellow.) Now develop the film, and — whamarama! a beautiful color image, far sharper than you'd see off the color picture tube. I am presuming that this box also performs the electronic separations and controls the framing.

Now all we need is a decent-priced 16mm movie camera to go with it, and a nice movie-editing system done around videotape. Then we can go to our local Fotomat in the parking lot, get a videotape transfer, and make synthesized movies without workprints — dammit, it's all coming together so *slowly!*

Xerox Palo Alto Research Center, from which Ethernet was cast, figured by implication in another byplay — small, though symbolically important. Rosetta's version of the Smalltalk language (see review of Hypercon 4, this section) was on view in the personal exhibits. A few people seemed to think that the original Smalltalk developers at Xerox PARC might be distressed by this development. But this would seem unlikely. After all, Kemeny and Kurtz, Iverson and Backus don't mind when independent vendors bring out versions of *their* languages — Basic, APL and Fortran — and Smalltalk is likely to achieve the same recognized greatness.

A different question is whether Xerox is going to assert trademark over the name "Smalltalk" — and opinions seem to vary on this matter. So far there is no published indication of such an intention.

So the Rosetta fellows aren't violating anything. Yet.

American Used Computer was banished inside by the stuffy and pompous Convention Fathers. Boo.

The Sessions

At the big conferences you have to pace yourself. Fifteen years ago, I used to scuttle from ballroom to ballroom, hungry and out of breath, scribbling down everything I heard. But it was all new then, and subfields were being invented every month. Now most of the topics are old — at least the ones that make it to the NCC schedule — and many session chairmen treat it as a chore. I hit only a few.

The session on computer animation was a nice summary and retrospective of high resolution stuff, especially of the work from New York Tech (crowned by Emshwiller's "Sunstone"), and the beautiful graphics of Demos and Whitney from Information International.

The session on computer-controlled special effects was really crowded. I passed it up, to my regret, for an uncrowded session on "libraries of the future" — which seemed to stress the hypothesis that trained librarians should design the electronic libraries of the future, which they say may or may not be something like card catalogs or the *New York Times* data bank. Hmm. (See Hypercon review.)

Fred Gruenberger's "plenary session" at the Personal Conference turned out to be a number of heavies from the straight computer industry pontificating to a scattering of people in a mostly-empty ballroom on why personal computing "hasn't taken off yet." (What hasn't it taken off?) From the way they were talking, the field will be swallowed up by corporate giants as soon as it becomes worth taking over. If this can be taken as representing the attitude in the conventional industry, I'd say the surprises are not over yet, and we'll see who is going to swallow whom. (By 1990, personal computing will be bigger than the rest of the industry. Mark that down.) The industry straights don't yet see the computer as an interactive movie-machine,

which will by then be its central function; and the talented creators of interactive software will not be coming out of the Cobol mills. They're in the cottages and basements with their Apples and PETS and TRS-80s and Ataris.

Another, utterly different "plenary session" — this one rather full — heard from the chairman of the Walt Disney organization about EPCOT. Now, if you are a Disney fan, you know that EPCOT was Walt's crowning dream — the Experimental Prototype Community of Tomorrow — a new kind of residential suburb in Disney World, whose design only Walt could imagine or understand. Now, this was really interesting, because if Disney World was actually going to house an ongoing community of citizens, what would it be like? Would there be slums? No. Churches? Of course. Adultery? Teenage naughtiness? Bubblegum? Minorities? Well . . .

Surely here was a problem to tax even the greatness of Walt Disney's spirit and imagination (and I am not being facetious). Because all of the Kansas City values and gumdrop euphemism that Disney's work expressed would have been hard-pressed

The new PMC-80, a TRS-80 look-alike from Personal Micro Computers Inc., Mountain View, CA.

to deal with the smarmy reality of a breathing, unsalaried, human *population*. I think he would've done it, and I think it would have been a damned interesting synthesis.

But we'll never know. The great man is gone, and committees oversee the accumulation of the wealth, and put out movies like *The Black Hole*. And the Disney chairman came to tell us all about how EPCOT was going to have pavilions and a convention center and rides and attractions. In other words — another amusement park.

He would entertain questions. I leaped up and asked, very politely, about Walt's Dream, as I thought I'd understood it, of a *real* Experimental Prototype Community of Tomorrow, like with people actually you know Living In It.

No, said the chairman gently, that could not be, that could not have been Walt's Dream. Because if people lived there it wouldn't be Tomorrow any more, would it, it would be Today. And besides, the instantaneous overnight visitor population of Disney World is already in the tens of thousands anyhow, so there's your EPCOT right there.

He said it nicely, and I suppose the organization has done the right thing. And this way there won't be demonstrations and town meetings and local kids going wrong. Because the only man who could have made such a thing work is gone now. But gosh, golly, gee whiz, shucks, see here — I sure was hoping to live there.

The Fourth Hypertext Conference

Hypercon 4, in Swarthmore, Pa., in April, was the first of the Hypertext conferences not advertised to the public.

I and my co-workers on the Xanadu™ Hypertext System hold these shindigs about every six months to keep our spirits up and propagate the faith.

First, about hypertext: it simply means "non-sequential writing." There are lots of places that writing might be better off in non-sequential structures. And others are working on hypertext of one sort or another, notably Engelbart (now at Tym-Share, where his system is being marketed under the name "Augment"), and van Dam at Brown University. So that "Xanadu" is our trademark for our kind of hypertext, soon to be a commercial offering.

Xanadu hypertext is built around windowing and linked documents. A windowing document simply has a window to another document: that is, Document A may quote a part of Document B. We hope to make this practical, however, and make it also our solution to the copyright problem: the author of Document A gets a continuous royalty while Document A is being fed out to a user, but when the part that's windowed from Document B is fed out, now the author of B gets the royalty. (I say "author" for simplicity's sake: it might be the publisher, or some other owner.) Any document stored anywhere in the Xanadu network — if we manage to get a network going — can window to any other document. The same for links: you can put your own private footnotes, marginalia or underlinings on anything — or publish a document with public links to any others.

The whole point is to build an overall system whose ground rules are fair, and powerful and sweepingly simple — and whose software is efficient, that is to say, feasible. We hope to demonstrate the system this calendar year, and even dream of franchising it nationally — so that where you see the big golden X on the highway, you'll know where to plug in for your local entry to the net.

Now, a little thought will disclose that if any author can window to any document stored in an expanding network, there are certain questions of storage, data structure and indexing techniques that get fairly serious fairly fast. Which is why the project has taken so long (twenty years). But we're still working hard on it — six to eight active people, depending on who you count — and operationality is in sight.

Well and good. The first three of our semi-annual conferences were open to the public, but not many people came, apparently because civilians have a bit of difficulty figuring out what in the world we're talking about — if you have *no* experience at a keyscope, have never heard of time-sharing or word processing, and have only the haziest idea of what a computer might be, face it, you may not enjoy the conversation very much.

Also, we've been talking about this system a long time, and laymen get a little impatient. They can't quite see what's holding things up — why isn't it ready? After all, computers store information, don't they? Never mind this algorithm and debugging business.

So this Hypercon we decided to hold as a private party. But we managed to bring in a nice group, very highly qualified.

There were guests from Yourdon and Humrro and Capital Children's Museum, National Science Foundation, *The Washington Post*, Western Printing, and the Beck Corporation, to name a few; also the Church of the Holy Starship.

Language freaks came aplenty: Scott Guthery was there (the developer of Tiny C), Leor Zolman (creater of BDS C) and, from Texas, Scott Warren and Dennis Abbe (inventors of Rosetta Smalltalk).

In the morning we covered the Xanadu system's design, again, as must be done for any new group. Then in the afternoon, under a balmy sun, we hammered on such questions as corporate financing, how we relate to video cable as a delivery system, and the body of law that makes a printer a co-defendant in cases of libel — which holds sinister portent for electronic publishing. It means The Bad Guys can shut down anything they don't like just with highly-financed libel suits. Or can they?

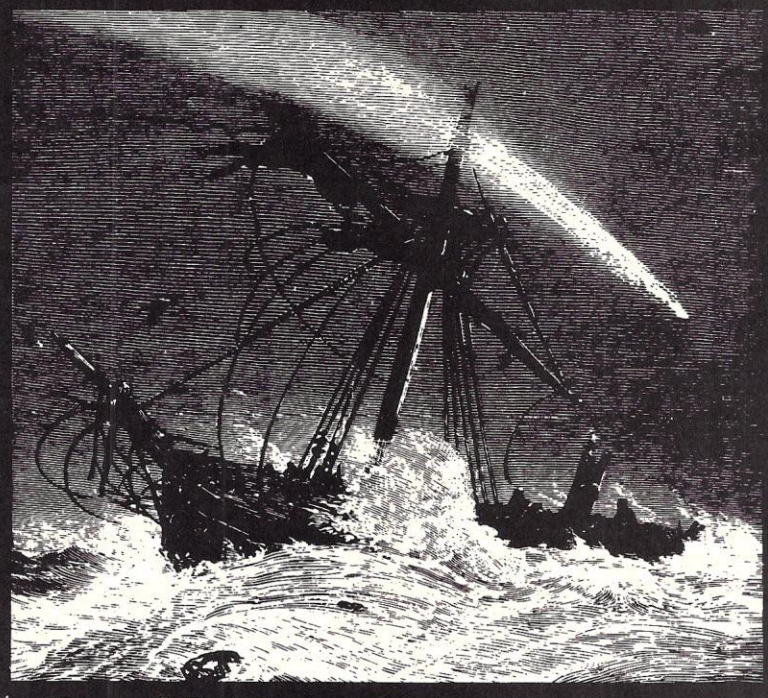
After a bounteous Chinese dinner, catered by a Swarthmore student, the group turned to festivity and bibulation and unstructured deprogramming.

The Becksters unpacked their Beck-1, a Z80 machine with CPM and a TV input that does nifty real-time picture conversion, and snapped our pictures on the diningroom table.

The Rosetta folk unpacked their Sorcerer and disk drive and showed us their Smalltalk.

Lawsy, what a demo that was, as Scott Warren showed us the magic of Smalltalk on the Sorcerer screen. He created windows with text in them, riffled and shuffled them on the Sorcerer screen like a card-sharp.

Some thirty very high-level software



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Position, cont'd...

types stood chin-to-chin in my study for an hour transfixed by Scott's razzle-dazzle.

Some remarks on the Smalltalk family of languages are in order about here, as well as about their place of origin, Xerox Palo Alto Research Center (PARC).

If IBM is like the Soviet Union — millions marching in lockstep, Ve Know Vot Is Good for De Pipple — Then Xerox PARC is like Versailles. Its inhabitants frolic in palaces and gardens — that is, with unceasing access to breathtaking delights that we commoners would give an eye for. In particular, the Learning Research Group has its Smalltalk language, running principally on computers called Altos, which are all over the building.

Smalltalk is totally inside-out and upside-down compared to any other computer language, and we will be expounding it more fully in later issues. Suffice it to say, however, that the language's power for graphics and interaction is unrivalled;

Xanadu hypertext is built around windowing and linked documents. A windowing document simply has a window to another document.

and that no version of it has been available anywhere, until this implementation by Rosetta. And while in many ways the Rosetta implementation does not use the more advanced concepts of the later PARC Smalltalks — it does not compile, for instance, and disallows "classes of classes" (watch future issues) — nevertheless, it is the first language of this family to escape the walls.

The Rosetta gents said they weren't sure whether they should bring this product to market yet, because it was so slow. Unanimously the Hypercon multitude said yes, they should, we wanted it, and so on. Thus was Rosetta led down the path to the NCC.

A good time was had by all. The tape recorder didn't work, but posterity needn't worry; most of what was covered was old ground.

Still, people had enough good vibes and good thoughts, and were sufficiently glad just to meet each other, to make it a bang-up day.

The next Hypercon is tentatively scheduled for December, and will be open to the public. But drastic measures will be needed to correct one problem: the small percentage of women (less than ten). We are considering including a Costume Ball, couples only, as incentive to bring in women. Other suggestions are welcome. □

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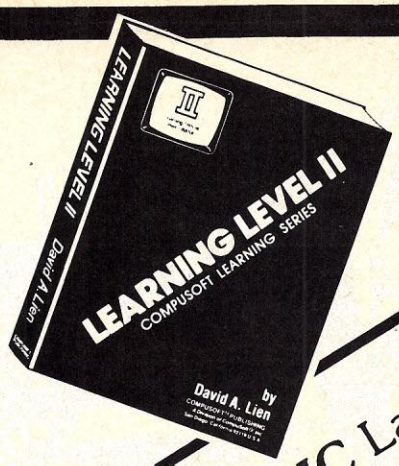
. . . BY THE AUTHOR OF THE FIRST HALF.



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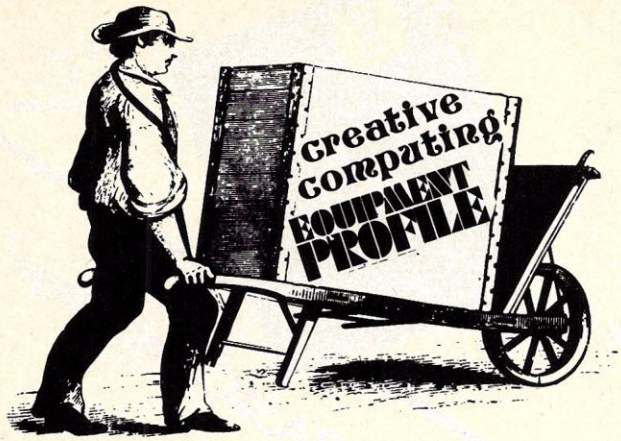

Beta-80 from MECA

Eric VanHorn

Despite the numerous changes in computer technology, many peoples' everlasting impression of computers is large, spinning reel-to-reel tape drives in old science fiction movies. And despite many predictions of their demise, tape drives are alive and well, even in the small computer industry. MECA makes a number of tape drives for small computers, among them the BETA-80 for the TRS-80.

The BETA-80 has little resemblance to the slow and unreliable cassettes that most people have used at one time or another. Its shell is an unobtrusive gray, sheetmetal box that measures about 8" on a side and 4" high. The only control is a rear-mounted on/off toggle switch with a front-mounted on/off LED. The BETA-80 uses digital cassettes that load in the top of the box.

Like the TRS-80 disk system, the operating system automatically boots when the keyboard is turned on.

Interfacing depends on how the BETA-80 is to be used. The simplest configuration is to use the tape drive with a 16K Level II TRS-80, in which case a ribbon cable is plugged in to the edge connector at the left rear of the keyboard. Like the TRS-80 disk system, the operating system automatically boots when the keyboard is turned on.

The BETA-80 can also be used with an expansion interface as either a stand-alone bulk storage device or in conjunction with a disk drive as disk back-up. This does, however, require a minor jumper modification in the expansion box. If you are squeamish about making any hardware modifications, MECA will make the change for you. As a stand alone device, the BETA-80 automatically loads and executes the same way it does with the basic TRS-80. As a backup device, a port must be addressed using the OUT x,y command in Basic.

Because of its high speed operation, the BETA-80 requires digital cassettes. In a pinch it will work with regular audio cassettes, but they will not be reliable. The cassettes must be formatted, and contain two tracks with up to 999 256-byte blocks on each track. This gives a tape capacity of 512K per tape, although tapes can be formatted for a shorter number of blocks. Anyone who has had to work with the 56K capacity of TRS-80 disks can imagine what a luxury this kind of storage size is.

The primary commands in Basic are:

SAVE	(filename)	(track)
KILL	(filename)	(track)
NAMES	(track)	
LOAD	(filename)	(,R)
MERGE	(filename)	(track)

Filenames are up to 5 characters long. The track numbers, 0 and 1, are indicated the same way drive numbers are in disk systems. Save "TEST:1" would save the file test on track 1.

NAMES is the directory command. Up to 66 filenames can be saved on each track, so 132 files can be saved on a tape without running out of directory space. Because the directory is stored in RAM, the directory need not be read every time a NAMES command is issued. The Directory is automatically read in on start up and must only be reread if the tape or logged-in track is changed.

The BETA-80 operating system also allows for automatically loading and executing programs. Load "TEST,R" will load the program TEST and Run it. This, among other things, makes it possible to have menu driven tapes.

The SAVE command also can be used for file handling. All files are saved as arrays. The information to be saved is stored in an array, then simply saved using the array variable. Even though Level II Basic only recognizes 2 byte variable names, the BETA can still use a five byte file name by only looking at the variable name and the first 2 bytes of the specified file name. The OS is "smart enough" to automatically convert from one to the

other. File array names are all followed by an asterisk (*). Despite the fact the tape hardware is slower than a disk system, this simplified file handling process can actually make the overall speed faster.

Finally, file merges can be performed to concatenate Basic programs. This is not only useful for development work, but data statements can be merged during program execution to provide a different means of doing file handling.

For Basic programmers, this is as far as you will probably go, but for machine language programmers, the BETA-80 really shines. By getting out of Basic and into the operating system, a variety of versatile and simple instructions allow you to load, save, merge, and move machine language instructions. An OS command is also provided to dump memory. All these commands can also be used in Basic. The syntax is similar to that used in Newdos for accessing utility programs in the operating system. EX 4000 will execute a machine language program starting at a memory location 4000H. In Basic, CMD "EX 4000" will perform the same function.

Generally, the BETA-80 has been very reliable. Occasionally there will be a boot failure, but the system has always booted on the second try. I have been using MAXELL Digital Data Tape (about $8

For machine language programmers, the BETA-80 really shines.

each) and have never had a media problem. My only real complaint about the hardware is that the tapes can be hard to mount in the drive.

The software is extremely good — much better than I expected. Formatting tapes is slow — it takes about 20 minutes — but since the storage capacity is so great this is only a minor inconvenience. The software includes the OS, a debugger, Star Trek, and a mailing list program to demonstrate file handling. I also understand Electric Pencil is available on tape.

My only other complaint is the speed. The BETA-80 works at 4800 baud, which is certainly better than 600 baud cassettes, but I did wonder why they didn't go ahead and set it up for 9600 baud. That extra speed would make a big difference, particularly when compared to disks.

MECA tape decks are currently available for TRS-80, Apple, Sorcerer and S-100 computers, and can be ordered with an optional printer port. Anyone with one of the above computers should certainly consider tape as an alternative or complement to disk systems.

For more information, contact MECA, 7026 O.W.S. Road, Yucca Valley, CA 92284 (714) 365-7686. □

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VisiCalc: Reason Enough For Owning A Computer

Doug Green

Ideally your computer should be able to act like a cross between an electronic piece of paper and a pocket calculator. That seems to be just what the people at Personal Software, Inc. had in mind when they developed VisiCalc. VisiCalc is not merely a piece of interactive software, but in some respects is more like a separate programming language. It is extremely powerful, and handles many varied jobs with aplomb. When used properly it can save a great deal of time that would ordinarily be spent programming or using several pieces of software. VisiCalc cannot do some of the things that high level languages can do, but what it can do, it does very well indeed.

It takes much less time to learn virtually everything there is to know about the VisiCalc system than it takes for any other programming language you can think of. In my case it took about seven days averaging about one and one-half hours a day to become conversant with all that VisiCalc has to offer. This is in sharp contrast to the various high level programming languages that demand much more of the learner in exchange for their greater flexibility.

Not only does it take only a short period of time to understand the entire VisiCalc system, but it takes almost no time to begin getting results from this remarkable piece of software. This is an opinion that I share with everyone that I have demonstrated this system to, as well as several people in the computer business who already use VisiCalc or supply it to other users.

Doug Green, Cortland Jr.-Sr. High School, Valley View Dr., Cortland, NY 13045.

A Window Into The Computer's Memory

After you load in the VisiCalc disk you will have the basic electronic sheet of paper on your screen. As you can see from Photo 1, it has 20 rows and four columns. Each location in this grid is identified by the number of the row and the letter-code at the top of the column, for example, A1. The cursor in VisiCalc is much wider than the usual single-character cursor; it takes up the entire entry that it occupies on the grid.

The amount you can store is limited more by the size of your computer's memory than it is by the VisiCalc sheet.

Any entry on the sheet can either be a number, a word, or a function of the contents of other locations. This is one of the reasons that VisiCalc is so powerful. Whenever a location is changed by the user, *all of the locations that depend on it are automatically recalculated.* It is this aspect of VisiCalc that is so striking and so useful.

Let us say you have told the VisiCalc sheet to derive column C in some way from columns A and B. Then if, for some reason, you change any of the values in columns A or B, new

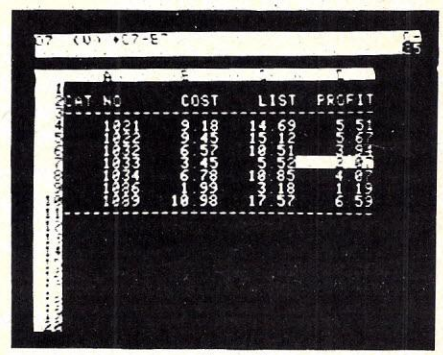


Photo 1

results in column C will be displayed automatically. This is like using FOR . . . NEXT commands in immediate mode without ever having the contents of your memory leave the screen.

Although what you see is limited by the number of spaces that can be displayed on your screen at once, the electronic sheet is actually much larger. There are 254 rows and 63 columns where information can be stored, and the amount you can store is limited more by the size of your computer's memory than it is by the VisiCalc sheet.

Keeping track of the remaining memory is very simple since it is constantly displayed in the upper right hand corner of the screen.

You may only see 20 rows of data at one time, but the number of columns can be varied by changing the width of the columns. You can also store more information in one of the grid locations than it appears able to hold. The system will remember exactly what was entered regardless of how narrow you choose to make the visible col-

umns. The screen will display as many characters as you allow for, beginning from the left of your input.

In addition to the grid, there is space at the top of the screen where other important information is displayed.

The white bar displays the contents of the location where the cursor is currently residing. This can either be a value (v) or a label (l). These terms are analogous to numeric and alphanumeric variables that one deals with when using Basic; except just a value can be an expression referring other locations in the table.

The Clear command requires three keystrokes, a fact that saved me from clearing the VisiCalc sheet at a time when I was really trying to do something else.

Two Independently Scrollable Windows

If you are not satisfied with the information that you can see on the screen at one time, you can split the screen in either the horizontal or vertical direction and look at whatever portion of the sheet you like in either window. A common use of this feature is to display the upper left corner of your sheet in the left window while the lower right portion of your work is displayed in the right window. That way you can change your initial entries and watch your totals change at the same time. Photo 2 shows an example of how this might be put to use while analyzing the family budget for the upcoming year. Instead of wondering idly what would happen to your savings for the year if the electric bill goes up five dollars a month, you can find out just by typing over the information that you would like to see changed. As you might guess, this will change the entire row that lies beyond the changed data, along with all of the column totals that depend on these figures.

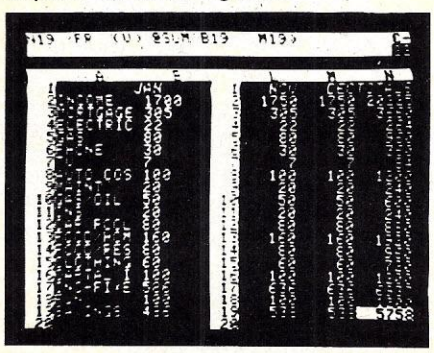


Photo 2

The Replication Feature

Another impressive feature of this system is the ability to replicate similar functions down a row, across a column, or in both directions at once. For example, if you wish to have VisiCalc derive values for column C by subtracting those in column B from the corresponding values in column A, all you need do is type in the directions for the first location in column C along with directions for replication. This will cause column C to be completed in an instant.

If you are trying to complete a table of entries that depends on the values stored in the top row and the left hand column, all you need do is supply the directions for the entry located at row two, column two along with the replication commands and the screen will fill before your eyes, much faster than most users could type in the specific formulas to perform such a task.

Cursor Control

The ← and → keys are used to move the cursor from side to side and up and down, while the space bar is used to change the direction of cursor movement from horizontal to vertical and back. For rapid movement you can hold down the repeat key. There is also a GOTO command that allows you to move the cursor to any location on the sheet with just a few keystrokes.

The little dash in the upper right hand corner of the sheet tells you which way the cursor is currently prepared to move. The letter next to this dash, either a C or an R, lets you know the current direction that the recalculation will occur in. You can instruct VisiCalc to recalculate down the columns (C) or across the rows (R). This will depend on how you have set up the entries in your table.

The ESC key is used to recover from simple typing mistakes. If you press it often enough it will erase all

VisiCalc Functions

SUM	Calculates the sum of the values in a list
MIN	Calculates the minimum value in a list
MAX	Calculates the maximum value in a list
COUNT	Results in the number of non-blank entries in a list
AVE	Calculates the average of the non-blank values in a list. The maximum number of values in the list is 255.
NPV	Calculates the net present value of the cash flows in a list, discounted at the rate specified. The first entry in the list is the cash flow at the end of the first period, the second entry is the cash flow at the end of the second period, etc.
LOOKUP	Used with a list of items that are ranked in ascending order. This function returns the value from the list that is less than or equal to the value referenced in the command given.
PI	Returns the value of 3.1415926536
ABS	Returns the absolute value of the value given
INT	Returns the integer portion of the value given
EXP SQRT LN LOG10 SIN ASIN COS ACOS TAN ATAN	Calculates the appropriate function. The trigonometric calculations are done in radians
NA	Results of a calculation are not available. This makes all expressions using the value display as NA.
ERROR	Results in an "Error" value that makes all expressions using the value display as ERROR.
>>>>	This means that there is not enough room to display the calculated value in the room available. Making the columns wider will often allow the value to be displayed.
Scientific Notation	VisiCalc will automatically shift to scientific notation if necessary in order to display a value in the space alotted.

Table 1.

VisiCalc, cont'd...

that you have typed in since you last hit the return key. As you enter data for a given location it appears on the so-called prompt line, the line between the white box at the top of the sheet and the grid. When you close an entry by hitting return, or moving the cursor to another location on the page, the contents of the prompt line are calculated (if necessary) and placed in the location on the grid that you have just dealt with.

More Functions And Commands

There are a number of other functions that are available to VisiCalc users. These are all listed in Table 1, but a few deserve special mention. The sum function is especially useful to anyone dealing with columns of numbers that must be added. (Think of all the time operators of small businesses can save by not having to bang number after number into a calculator. With VisiCalc they only need to be written once.) You can also ask for the average of a range of values along with other common functions used in business, science, and mathematics.

The list of commands is also impressive. With a few key strokes you can blank out any location, add or delete a row or column, move a row or column to a new location on the page, or repeat a number or letter across any location in the grid. This last command is especially useful for drawing lines across the page like those in Photo 1. There are a number of commands that can change the format of a given location or the entire window that the cursor is located in. The choices for these format commands include: general, integer, dollars and cents, left- or right-justified columns, and graphing. This final command can be used to construct simple bar-graphs for information displayed in a range of entries selected by the user. This is shown in Photo 3.

Other commands couple or uncouple the movements of pairs of windows, fix the titles on the screen as the cursor moves down or to the right, and replicate formatting across a whole column or row, or the entire contents of the current window. These commands require between two and five keystrokes each depending on what is being accomplished. (The Clear command requires three keystrokes, a fact that saved me from clearing the VisiCalc sheet at a time when I was really trying to do something else.)

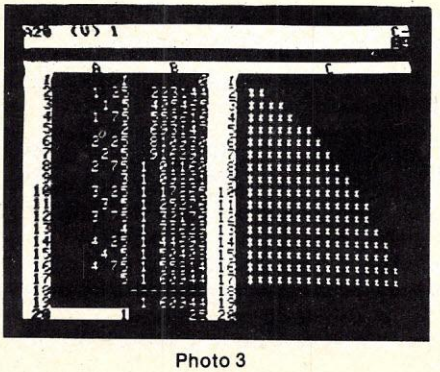


Photo 3

VisiCalc manages its own storage in its own format. It provides storage commands allowing you to save files on disks or cassette tapes, load files from a disk or a cassette, delete a file from a disk, or initialize a blank disk so that it will be ready to receive VisiCalc files for storage. It is easy to ask for a list of the file names on a given disk. You can also print the contents of your sheet on a disk as a "text file." This file can be read by other programs in Basic, for example, and the information can be further processed in this manner. (This feature permits you to perform whatever other functions you may feel are missing.)

Similar commands will result in the printing of your electronic sheet by your printer. The output will be what is actually on the sheet, as opposed to what appears in the window, so be sure to pay attention to the line width of your printer. In any case you can specify the portion of the page that will be printed with the issuance of the proper print command.

Stay Tuned

Your purchase of the VisiCalc package includes an instruction book that contains an introduction and four lessons. As I read through the book and carried out the examples I found the text to be easy to understand. The explanations were certainly cleaner and better than those I have seen in most systems programing manuals. Along with the book, which is in a handsome 10 x 7½ inch three-ring binder, you receive the VisiCalc reference card. This contains a summary of all of the VisiCalc commands and functions and is extremely useful for users who are new to the system. It would also be invaluable to infrequent users. When you send in your warranty card you will receive the first copy of the VisiCalc Newsletter free. Original owners are also protected from any defect in the disk for 90 days, and replacement thereafter for $15.00.

The people at Personal Software, Inc. are planning to improve the system and offer the updated versions to original owners at a reduced price. They also encourage users to suggest changes and additions to improve the system. As a VisiCalc user I would suggest that they add some of the more commonly used statistical functions to those listed on Table 1. The ones that I would suggest would be: standard deviation, one or more correlation coefficients, and perhaps the ability to do a t-test and a least-squares linear regression; but new functions, must use up too much memory.

Whenever a location is changed by the user, *all of the locations that depend on it are automatically recalculated.*

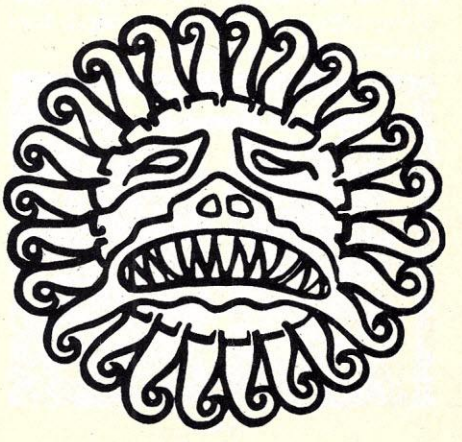
Machines And Memory Requirements

Although the version I used was designed for an Apple system, it will soon be available for other makes of small computers including Pet and Atari. It is only available on disk and requires a minimum of 32K of RAM. Additional memory will allow for the storage of a much larger electronic sheet but all of the systems' features are available for users of 32K systems.

The version that I used (version 35) requires 23K for the resident program. This means that for a 32K system there remains only 9K for storage of the electronic sheet. This still allows for a reasonable amount of storage, but for most business applications it would be a good idea to have 48K available.

Worth The Money?

If you are in business, the chances are that the cost of a VisiCalc disk will be one business expense you will gladly bear. The current suggested retail price is $150.00. This may be a bit steep for someone who only needs to do his check book and the family budget, but for almost anyone in business, education, or any science-related field it is not only worth the initial expense, but reason enough to purchase a small computer system in the first place. □



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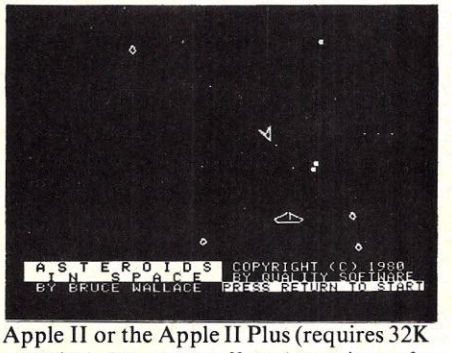
Asteroids in Space

Chris Vogeli

Have you ever been in a game arcade and watched as some poor soul dumped megabucks worth of quarters into a game? Many have turned into game addicts, spending $10 and more each night in order to become the 'best' at one game of skill. At present, the most popular games are Space Invaders, Galaxian and Asteroids.

Predictably, the hottest software packages on the market are adaptations of these arcade games. Super Invasion for the Apple II is currently the most popular computer game, largely owing its success to exact adherence to the arcade format. A new program, Asteroids in Space, is in the same vein as Invader. Asteroids for the Apple II duplicates the fun and excitement as well as the superior graphics and strategy of the arcade version of the game.

Asteroids is written in machine language and can be run on either the



Apple II or the Apple II Plus (requires 32K and disk). The game offers the options of a demo or 'attract' mode plus selection of fast/slow missile and asteroids speeds. The rotation, thrust and missile cannons of the players ship are controlled through the Apple game paddles. In the game, the ship starts at the center of the screen and asteroids bombard it from all directions. The player must move and/or rotate the ship to avoid asteroids and destroy them with missile cannons. A missile hit on a large asteroid sends up to 4 small chunks reeling through space which must also be destroyed with the cannon. As the game progresses, increasing speeds and more asteroids make winning no easy task. To compound problems, a small alien flying saucer, bent on destroying your ship, is randomly released. Warning: The alien is loaded with torpedoes and very rarely misses.

All in all, Asteroids in Space makes for an exciting game and certainly is worth $19.95, and probably a substantial savings in the long run compared to 25 cents a play in the arcades.

Available on disk only for $21.45 postpaid from Quality Software, 6660 Reseda Blvd., Suite 105, Reseda, CA 91335 (213) 344-6599.

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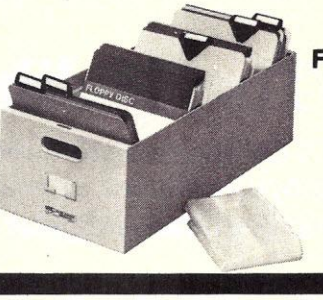

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A Conflict Simulation For Personal Computers

Computer Bismarck

Randy Heuer

It is difficult to determine just what features make a computer simulation enjoyable. Using very vague terms, a computer simulation should be challenging but not impossible, and of course should be something that would ordinarily be difficult to do without the aid of the computer.

Perhaps one of the first "good" computer simulations was the classic "Star Trek" game. The commander of the *Enterprise* was faced with two separate challenges in each game. One was the strategic problem of the overall destruction of the entire Klingon fleet in a given amount of time. The other was the tactical challenge of handling the combat situation in each quadrant.

Admittedly, most "Star Trek" type games are generally not difficult to win after several sessions, but the length of time "Star Trek" has endured attests to its popularity. Some more recent good computer simulations that come to mind — although not all conflict simulations — are *Galactic Empire* (Softside), *Three Mile Island* (Muse) and *Air Traffic Controller* (Creative Computing). All of these simulations feature an overall problem that is overcome by solving many small problems. It is this two-step thought process that makes these games interesting.

Now there is a new simulation on the market which again confronts the player with an overall problem that can only be solved through the solution of many small problems. *Computer Bismarck* is perhaps one of the most complex home computer simulations produced to date. Its level of complexity may be too much for some; however, for those who find most computer games dull after a few sessions, *Computer Bismarck* may provide the challenge they've been seeking.

The Historical Perspective

For those not familiar with World War II naval history, I'll briefly outline the situation that *Computer Bismarck* attempts to simulate.

At the beginning of the war, the German battleship *Bismarck* was probably the finest battleship afloat. Although the British possessed a greater number of capital ships, none of her battleships could match the *Bismarck*.

In late May 1941, the *Bismarck* and the cruiser *Prinz Eugen* left port from Bergen, Norway. Their mission: to intercept Allied merchant convoys supplying England with vital war supplies. The U-boats had already deeply hurt the British war effort, and these immensely powerful German surface ships loose in the Atlantic could completely disrupt this tenuous link.

The next few days would prove to be fateful for both sides. In the first engagement between the German duo and the British battleships *Hood* and *Prince of Wales,* an early salvo from the *Bismarck* penetrated the *Hood's* deck, exploding the ship's main ammunition magazine. In a matter of seconds, the *Hood* sank and over 1400 men died. The *Bismarck* then escaped the shadowing British cruisers.

The diversification of the German player's possible strategy also makes it difficult to determine whether the computer is really playing a good game or randomly wandering about the map.

However, fate soon turned against the *Bismarck:* a lucky hit from a British Swordfish torpedo plane disabled the *Bismarck's* steering while she was steaming toward France. With the *Bismarck* practically helpless, the British engaged the German ship with a sizable force of ships, and after a few hours the *Bismarck* went down with over 2200 men.

The Simulation

So much for what really happened. The computer simulation, though, lets us explore the many things that *might* have happened. In *Computer Bismarck,* players take the role of the commander of either the British or German fleets. Or a lone player may command the British fleet while the computer controls the German forces.

Two versions of the program are presently available. The one reviewed here is the 48K Apple version (for ROM Applesoft). This package requires a disk drive and retails for $59.95. (A less sophisticated cassette version for a 16K TRS-80 is also available, but since I have not seen it I cannot say what the similarities and differences are from the Apple version. The TRS-80 version sells for $49.95.)

The Apple version comes packaged in a rather oversized box about the size of many of those "bookcase" games from Avalon Hill and others. Rattling around inside are an instruction booklet, two sets of playing charts, a pair of very nice maps laminated in plastic, two grease pencils and the diskette. The multi-colored maps are coated with plastic so players may make notations on the maps with the grease pencils and then later erase them.

The rules are long and fairly complex; however, it is important that the players become totally familiar with the rules before attempting to play *Computer Bismarck*. I know that many people reach right for the diskette after buying a software package, but this is one of those games where not having a very clear understanding of the rules and their implications will be disastrous. In fact, I think I can safely say that most people will find this simulation impossible to play without reading the rules and having them nearby the first few games. The separate playing charts are also very helpful; indeed, unless you memorize all the necessary values, it's imperative that these also be on hand while playing the game.

For those people unfamiliar with conflict simulations (such as any of several published in board-game form by companies such as Avalon Hill, Simulation Publications, etc.), a grid is placed over a map of the field of play to facilitate movement. In *Computer Bismarck* a 20 x 18 grid is superimposed on a map of the North Atlantic. Each of the ships and planes involved is assigned a series of numerical ratings to represent characteristics such as speed, endurance, firepower, ability to absorb damage, detectability and search capabilities. On a given

Bismarck, cont'd...

turn, a player may usually move any or all of his units up to their movement limits. Thus the simulation is much more dynamic (and realistic) than games such as chess. Another feature unique to conflict simulations is that the element of chance may effect the outcome of a particular battle, although the player with superior forces will usually win. But nothing is guaranteed.

Perhaps the most unusual feature of *Computer Bismarck* is the fact that neither side is aware of the location of the other's forces except when a sighting occurs. The computer keeps track of the necessary numbers and determines whether opposing units can see and attack each other. Thus the players get the feel of the total blindness that the actual commanders must have experienced. It is this feature that makes *Computer Bismarck* unique among computer games and board games alike. Experienced wargamers will find this element particularly satisfying and frustrating at the same time.

The Program

We now get to the software itself (finally).

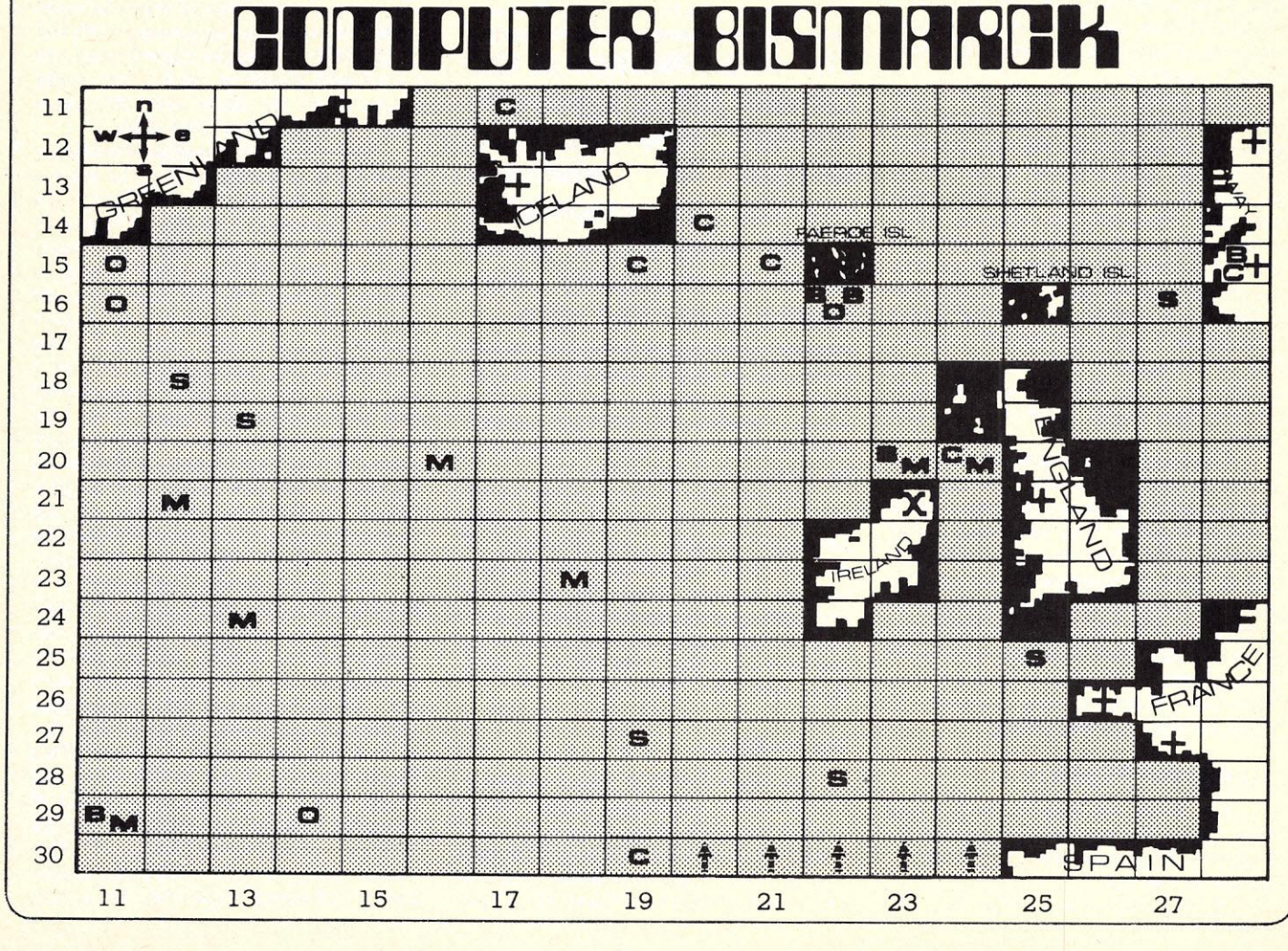
The game is played entirely on the monitor or TV screen. Before each player moves his units, a high-resolution map, with the present locations of the player's units, is displayed on the screen. The map itself is very well done, and the only small complaint I can register is that the movement-grid is not also superimposed; I believe this could have been done without serious program modification.

This is one of those games where not having a very clear understanding of the rules and their implications will be disastrous.

It's also a bit difficult from looking at the screen to determine which unit is which, as all the battleships are represented by B's, all the cruisers (light and heavy) are represented by C's, etc. Given the resolution problem of small computers, I don't know how this problem could be handled effectively. One solution might be to provide the players with cardboard counters like those in board games and let the players move them about on the laminated maps. I suppose people could make their own. (I should point out that if a player forgets the location of a particular unit, there are a couple of commands that provide either the present position of the unit when given the unit's name, or list the names of the units at a given gridpoint.) Despite these minor complaints, the display is fairly functional after one masters the command lists.

Players control the movement and actions of their units via a two-level command system. The player enters a two-character code for whatever action or display he wishes. To move his units, the player enters the appropriate code and then refers to the second command menu. The ships or planes that may move at this turn are then listed one at a time, and the player may enter the appropriate movement commands. As the player enters the movement commands, the units are moved about the screen — although a player may change any or all of his moves until he enters the DM (done move) command. At this point the other player moves his units via the same process. The actual updating of positions is done simultaneously by the computer after both players are finished.

Neither player is aware of the location of the opposing units unless a sighting occurs. This is accomplished by displaying only the player's own units on the screen



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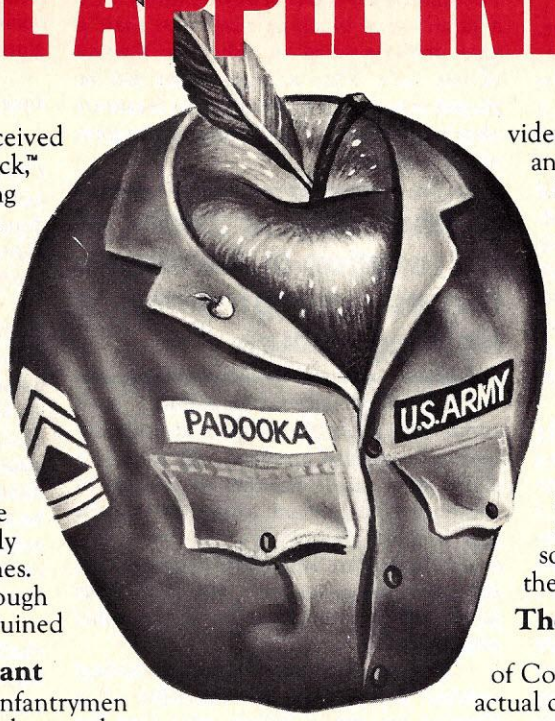

Judging by the letters we've received from buyers of Computer Bismarck,™ home computer historical wargaming is a great mind-stretching recreation to uncramp the old synapses after a few hours of trying to cram 54K of code into 48K of memory. But before you read any further, let us warn you that our *new* game, Computer Ambush,™ is more gut-wrenching than mind-stretching.

Strategy versus Tactics

Computer Bismarck is a "strategic" wargame, casting you in the role of a British or German admiral coolly deploying fleets of ships and planes. Computer Ambush is "tactical"...tough and dirty street fighting in a half-ruined French town.

You're a Sergeant

You command a squad of ten infantrymen (either American or German). Each man has a name, rank, and such individual combat skills as footspeed, strength, intelligence, endurance and marksmanship...all of which affect the success of every move you order. Your squad is armed with grenades, rifles, automatic weapons, plastic explosives, bayonets, and even garottes. You fight with carefully-aimed shots, area bursts, explosions, and hand-to-hand combat. They can result in wounds or deaths, depending on time, distance, the individual skills of each soldier, and your ability as a squad leader.

Battlefield

Street fighting is the most challenging tactical command situation in modern warfare. Using "Higher Text", a character generator, the computer displays a map showing buildings (your plastic explosives can turn them into rubble during the game), walls, hedges, doors, windows (nasty sniper positions), and each of your men by name. The enemy is usually hidden.

Play the Computer

The computer plays the German squad leader (*Feldwebel* Kurt Reich) to perfection. It defends the town with sniping, machine guns, grenades, and finally, with hand-to-hand combat.

You're Sergeant Buck Padooka. You maneuver your men and fire at revealed and probable German positions. If you kill all the Germans before they get you, the town is yours. But the computer's a tough, experienced squad leader, so don't expect to win very often.

Play a Friend

You take turns examining the video map display, moving your men, and firing weapons. Your options are limited by casualties, wounds, physical exhaustion, ammo supplies, terrain, and the individual skills of each of your men. The same is true for your opponent. And every action takes precious time, even the flight of a grenade or bullet. (Remember, time is life or death on the battlefield *and* in Computer Ambush!) After each turn, the computer displays the movements and weapons fire of both squads as tracks on the video map...just once, so watch carefully to figure out where the enemy is, or was.

The Sweat and Death of War

The time pressure and complexity of Computer Ambush create the stress of actual combat command. Your palms sweat as you watch PFC Chuck Lawson get blown away by that damned Kraut machine gun you forgot when you ordered him to sneak across the alley. If you can imagine a game that's more complex than chess, requires much faster decision-making, rewards courage and cruelly punishes foolhardiness...that's Computer Ambush!

$59.95 and an Apple

If you've got an Apple II Plus (or an Apple III or an Apple II with Applesoft Firmware ROM Card) with 48K memory and a 5¼ inch mini-floppy disc drive, you can be playing Computer Ambush in a few days. For $59.95, you get the game program disc; 2 mapboard charts (for plotting strategies in grease pencil while your opponent is at the computer); 2 squad leader's data cards; and a rule book. You also get a game selection card which tells you how to set up any of seven wargames: NCO Training, Ambush or Raid against the computer; and Patrol, Ambush, Strongpoint, or Free Form against a human opponent.

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Bismarck, cont'd...

during each player's turn. Before the game, each player enters a secret password so that his opponent can't see his map (unless the opponent knows his password). This is a worthwhile feature, although one player must leave the room on the other's turn.

The computer opponent (nicknamed "Otto Von Computer, Simulated Admiral") is also worth commenting on. Perhaps the biggest problem most wargamers face is finding an equally fanatical opponent to play against. *Computer Bismarck* solves this problem by providing a series of subroutines to play the role of the German commander.

"Otto" appears to play a fairly respectable game. I say *appears to,* since with the hidden-movement rule (and the fact that the program is LIST protected), I can judge "Otto's" ability only from the limited experience of a few games. The diversification of the German player's possible strategy also makes it difficult to determine whether the computer is really playing a good game or randomly wandering about the map. Generally speaking, "Otto" makes particularly good use of his U-boats and seems to use good judgment as to when to attempt to break his surface ships out into the Atlantic.

The typical game of *Computer Bismarck* lasts from two to five hours. Fortunately for those of us who rarely have a continuous block of time like that, a game may be saved on diskette at the end of any turn. Thus a single game can be played over a period of days. This feature is absolutely necessary with computer games of such duration.

Neither side is aware of the location of the other's forces except when a sighting occurs.

The only major complaint I have about *Computer Bismarck* is the missing tactical-warfare element. Although a player may decide whether to attempt to withdraw a ship, which target to fire upon and whether to fire torpedoes, very few other choices are left to the player once a combat situation occurs. Hits and misses just happen and the player has little control over this action.

In some ways this "missing" tactical combat phase may be somewhat of a blessing for many people who find the strategic portion of *Computer Bismarck* enough of a challenge. However, I find it disappointing that players have so little control over this part of the game after the complete control they've had up to this point. Maneuvering your forces in the decisive battle would add so much to the game.

Final Remarks

I suppose the final question is whether *Computer Bismarck* is worth the rather considerable cost. The answer really depends upon your taste in software. *Computer Bismarck* is probably not for everyone.

The point which I probably cannot emphasize enough is that it is an extremely complex simulation. In most computer games only one piece may move each turn. In this simulation, however, as many as thirty units may move on a turn. Changing weather conditions, fuel supplies, combat damage, and of course the clock, must all be accounted for in determining a player's overall move. Some people may find this extent of sophistication too much to handle.

However, for those ready for a challenging computer simulation, I enthusiastically recommend *Computer Bismarck*. These people will enjoy the complex problems that this game presents, at times frustrating and bewildering.

For more information on *Computer Bismarck,* contact Strategic Simulations, Inc., P.O. Box 5161, Stanford, CA 94305. □

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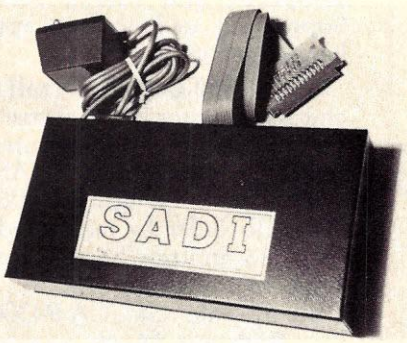

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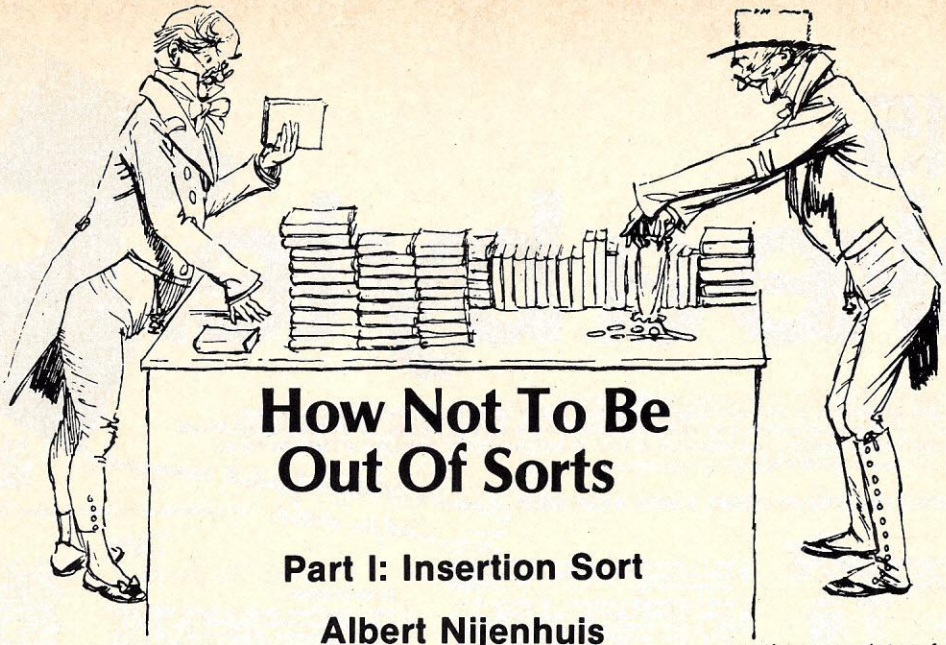

How Not To Be Out Of Sorts

Part I: Insertion Sort

Albert Nijenhuis

Why sort?

Sooner or later — always sooner than expected — you will have to do some sorting. Your list to be sorted may be a symbol table in a compiler, which has to be alphabetized, or you may want the largest 100 items, in order, in a list of 10,000. Perhaps you are a student who wants to update the mailing list for his school paper. Or, if you have a business, you may want to put in order the recently active accounts before updating the entire file.

Anyhow, computers spend a large amount of their time just sorting one list or another. Finding the right method for each job is therefore of great importance.

A Few Methods.

In this article and in two more parts to follow we will discuss just a few of the many available sorting methods, and indicate situations in which they are particularly useful.

Before you read on, it is useful to ask yourself how you would sort a list of, say, six numbers in increasing order. Chances are you would end up with something similar to the insertion sort which we discuss in this article, or the "bubble sort," which is very similar, and is often used as a programming exercise.

The **Insertion Sort** is extremely simple in concept, and is very easy to program. It is very suitable when, for example, you have to sort lists of length up to about 10. When the lists are longer, the number of comparisons it makes become very large, and the method is definitely not recommended. For short lists it is nevertheless very fast, because there is a minimum of book-keeping involved.

Albert Nijenhuis, Univ. Of Pennsylvania, Dept. of Mathematics, Philadelphia, PA 19104

Heapsort is a method which greatly economizes on the number of comparisons that are performed, by using the general principle that if "a < b" and "b < c" have been established, it is no longer necessary to compare a and c. Since the per-step bookkeeping is a bit more involved, it works a bit more slowly on short lists than the insertion sort.

Computers spend a large amount of their time just sorting one list or another. Finding the right method for each job is therefore of great importance.

Both insertion sort and heapsort use no array space except that in which the input data is stored. This feature makes these methods simple to use as a part of bigger programs.

The third method is a **linked merge-sort,** and will be discussed in the third article. It is particularly useful in situations where the items to be sorted are bulky and hard to displace, or where the input data already has so much of the desired order that not using this order would be wasteful. This sorting method does require some working storage, and its program is longer than the other two.

Insertion Sort.

We shall assume that the numbers to be sorted are stored in an array with n locations a(1), . . ., a(n), and the sorting consists of switching the contents of these locations so these contents are listed in increasing order.

The following way of looking at the problem is extremely important in understanding algorithms: we assume that the first j elements a(1) . . . a(j) are already in order. On first sight this may seem like magic — it may suggest that we have already solved the problem that we wanted to solve. In fact, it does nothing of the kind: whatever magic there is, is in the replacement of the fixed given subscript n by the subscript j which may, in principle, take any of the values 1, . . ., n. The statement "a(1), . . ., a(j) are already in increasing order" will be true for certain values of j and not for others. If it is indeed true for j=n, then we are finished, but that is only seldom the case. All we are allowed to assume is its truth for j=1, because any list with only one member is automatically sorted. What we shall do is design a method which, assuming the statement is true for any particular j, will cause it to be true for the next value of j. This method will thus lead us, step by step, from j=1 to j=n.

For example, suppose we had the list consisting of 1, 2, 6, 8, 12, 5. Then the statement is true for j=5, but not for j=6. To make it true for j=6, we compare 5 and 12, and interchange the two because they are out of order. This yields the list 1, 2, 6, 8, 5, 12. Still focusing on 5, we now compare it with 8, and interchange. Next is the comparison with 6 in the new list 1, 2, 6, 5, 8, 12, which again leads to an interchange. The next comparison, with 2, does not lead to an interchange, and we have just achieved the truth of the statement for j=6.

The story with general values of j is remarkably the same, though we rephrase it slightly. We first store a(j+1) in b to simplify the procedure. (So, in

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Software with Manual / Manual Alone

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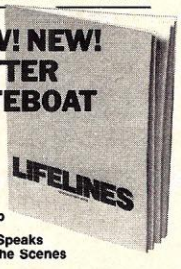

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†Recommended system configuration consists of 48K CP/M, 2 full size disk drives, 24 x 80 CRT and 132 column printer.

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Blackhawk Micropolis Mod II	Q2
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CDS Versatile 4	Q2
COMPAL-80	Q2
Cromemco System 3	A1*
Cromemco 22D	R6
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Delta	A1*
Digi-Log Microsystem II	RD
Digital Microsystems	A1*
Discus	See Morrow Discus
Durango F-85	RL
Dynabyte DB8/2	R1
Dynabyte DB8/4	A1*
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Exidy Sorcerer + Exidy CP/M	Q4
Heath H8 + H17/H27	P4
Heath 89 + Lifeboat CP/M	P4
Heath 89 + Magnolia CP/M	P7
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Horizon	See North Star
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ICOM 3712	A1
ICOM 3812	A1*
ICOM 4511 5440 Cartridge CP/M 1.4	D1#
ICOM 4511 5440 Cartridge CP/M 2.2	D2#
IMS 5000	RA
IMS 8000	A1*
IMSAI VDP-40	R4**
IMSAI VDP-42	R4**
IMSAI VDP-44	R5**
IMSAI VDP-80	A1**
Intecolor	See ISC Intecolor
Intel MDS Single Density	A1
Intertec SuperBrain DOS 0.1	R7
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ISC Intecolor 8063/8360/8963	A1
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MSD 5¼″	R6
North Star Single Density	P1
North Star Double/Quad	P2
Nylac Single Density	Q3
Nylac Micropolis Mod. II	Q2
Ohio Scientific C3	A3
Onyx C8001	T2#
Pertec PCC 2000	A1*
Processor Technology Helios II	B2
RAIR Single Density	R9
RAIR Double Density	RE
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REX	Q3
SD Systems 8″	A1*
SD Systems 5¼″	R3
Sorcerer	See Exidy Sorcerer
Spacebyte	A1
SuperBrain	See Intertec
Tarbell	A1*
TEI 5¼″	R3
TEI 8″	A1*
Thinkertoys	See Morrow Discus
TRS-80 Model I 5¼″	R2
TRS-80 Model I + FEC Freedom	RN
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TRS-80 Model I + Omikron 5¼″	RM
TRS-80 Model I + Omikron 8″	A1
TRS-80 Model I + Shuffleboard 8″	A1
TRS-80 Model II	A1*
VDP-40/42/44/80	See IMSAI
Vector MZ	Q2
Versatile	See CDS Versatile
Vista V80 5¼″ Single Density	P5
Vista V200 5¼″ Double Density	P6
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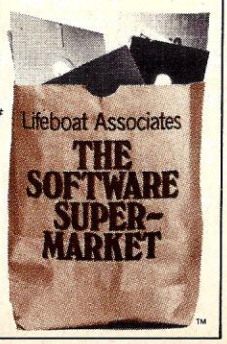

Sorts, cont'd...

the previous paragraph we set b=5.) Now, compare b with a(j), a(j-1), etc.; or to put it even better: compare b with a(i), where i successively takes the values j, j-1, . . . until termination is called for. If the comparison of b and a(i) yields that b is the smaller one,

```
1000 'SUBR: INSERTION SORT OF  A
     OF DIM  N
1010 FOR J=1 TO N-1
1020 LET B=A(J+1)
1030 FOR I=J TO 1 STEP -1
1040 IF B>=A(I) GOTO 1080
1050 LET A(I+1)=A(I)
1060 NEXT I
1070 LET I=0
1080 LET A(I+1)=B
1090 NEXT J
1100 RETURN
```

Figure 1

then move a(i) to a(i+1), and repeat the comparison, with i replaced by i-1. If, however, b is greater than, or equal to, a(i), then insert b into a(i+1). Finally, if i reaches O, then insert b into a(1). The insertion of b terminates the process, and the contents of a(1), . . ., a(j+1) are now in order.

The Basic program in Figure 1 performs the above insertion (lines 1020 to 1080) in a loop or J=1 to n-1. Figure 2 shows the sorting of a list, with the j-value above each column. The input list is in the left-most column.

j=	1	2	3	4	5	6	7	8	9
3	3	3	2	1	1	1	1	1	1
7	7	4	3	2	2	2	2	2	2
4	4	7	4	3	3	3	3	3	3
2	2	2	7	4	4	4	4	4	4
1	1	1	1	7	7	7	6	6	5
9	9	9	9	9	9	8	7	7	6
8	8	8	8	8	8	9	8	8	7
6	6	6	6	6	6	6	9	9	8
10	10	10	10	10	10	10	10	10	9
5	5	5	5	5	5	5	5	5	10

Figure 2

Sources On Sorting.

The literature on sorting is very extensive. Fortunately, a virtual encyclopedia of what happened before 1973 can be found in Vol. 3 of D.E. Knuth's *The Art of Computer Programming*, where some 350 pages are devoted to this one subject. Meanwhile, developments continue to be published in several journals, such as those of the Association for Computing Machinery. Look for them in your public or school library, or the library of a nearby college with an engineering program. **(Next: Heapsort)** ☐

Magic Wand Word Processor

Glenn A. Hart

Tastes vary in word processors. Some like the simple, others go for baroque. Here's one with every feature — virtually guaranteed to require a trained programmer for its fancier operations. —TN

The Magic Wand is a complete word-processing package with a distinct approach to providing a complete spectrum of word-processing facilities. Its developers have succeeded to a remarkable degree in implementing their design philosophies, since the finished product is effective and desirable. The Magic Wand is produced by Small Business Associates, 3220 Louisiana, Suite 205, Houston, Texas 77006, (713) 528-5158. Although no 'list price' is specified, the program is available for around $400.

Design Philosophy

Unlike most complete word processors, the Magic Wand consists of two separate programs, EDIT and PRINT, which must be loaded repeatedly to perform their respective functions. In this sense, the Magic Wand system is similar to separate editor and text output processor programs, but with a degree of integration not usually available from separate programs. One advantage of this approach is that the modules are reasonably sized (EDIT is 13K and PRINT is 20K), and only one must be resident in memory at a time. This leaves more memory room for text and also allows the programs to operate correctly in systems with smaller memory. With the upcoming multi-user operating systems which permit limited memory space for each user, Magic Wand's frugal use of memory may be a major factor in its behalf.

Magic Wand was designed to be as user-oriented as possible within a business context. Since the primary interface with the user is the editing function, the editor was deliberately kept rather simple. There is a definite tradeoff operating here: a simple editor is easy to learn and easy to use, but does not offer the 'power' of a more complex editor. An analogy to high-level languages is appropriate; there is little that a complex Basic interpreter can do that can't be done with a simpler interpreter, but it may take a few more program steps to accomplish the objective.

Magic Wand's designers also strove to emulate the high-priced dedicated word-processing systems as much as possible. A definite attempt was made to limit the number of keystrokes necessary to accomplish each task and to use any available function keys. Each copy is supplied with a customized Reference Card, which shows the specific assignments for the terminal to be used. With my IMSAI VDP-80, the cursor control and many of the special function keys are accurately mapped to the Magic Wand program as the machine designer intended. This is the only commercial program I own which makes use of these special keys, which reduces the amount of memorization required. Of course, use of special function keys does mean using a part of the keyboard not normally accessed, and it can take some typists a while to become accustomed to these keys.

The Magic Wand system is similar to separate editor and text output processor programs, but with a degree of integration not usually available.

Since the VDP-80 has a limited number of special function keys, several other editor commands are implemented with single control characters (which are also well chosen). Presumably a terminal with more function keys would have an even more customized layout, while a terminal without any special keys could use standard control characters.

This customization must be a time-consuming and difficult job for the program suppliers, and is indicative of the care and attention to detail that has gone into the program design. Obviously the Magic Wand is sold customized for a specific terminal and printer (Diablo, Qume and NEC Spinwriter versions are available), and no user modification of these parameters is possible. Local dealers are supplied with modules to adapt the program to different configurations when the program is first purchased, or if equipment changes are made later.

The documentation deserves special mention. It is truly first-rate in many respects, and obviously took a great deal of time and thought. Completely typeset for maximum legibility, it is structured as a lesson-by-lesson tutorial for totally inexperienced users. Amusingly, the student is presumed to be Abraham Lincoln's secretary, and early drafts of the Gettysburg Address and various letters are supplied as sample text. The step-by-step approach, and a refreshing sense of humor,

TABLE ONE

```
                    Edit System Status

Reading         Finished        SAMPLE.LET
Writing         Active          ACTUAL.LET

Workspace contains 17 Lines/Paragraphs

     Characters      34052-Total    229-In Use    33824-Remaining

Mode: Text
Line Width: 60

Tab Columns: 1 9 17 25 33 41 49 57

*
```

Glenn A. Hart, 51 Church Road, Monsey, NY 10952.

The MAGIC WAND™ is ALMOST PERFEC.

We've been saying it for a few months now, and the reviewers seem to agree.

"Until I saw the Magic Wand, if I were allowed to own one and only one editor, Word Star* would have been it. . . . My personal preference is for Pencil or Magic Wand for text creation."

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Larry Press
On Computing, Summer 1980

"Of all the word processors I have used (and that includes a dozen or more), the Magic Wand is the most versatile. The Wand has almost all of the features of other processors, plus many new ones of its own. It measures up to even the word-processing software running on the largest mainframe computers."

Rod Hallen
Microcomputing, June 1980

"The Magic Wand is one of the most flexible word processing packages available, and should be considered by any potential word processing purchaser."

Glenn A. Hart
Creative Computing, August 1980

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Wand, cont'd...

make learning a complex system easy and fun.

Using The Editor

The editor is invoked by typing EDIT with either one or two filename parameters. Using one filename causes this file to be loaded, edited and saved under the same name. Specifying two filenames allows editing an old file and saving it under a new name. A sign-on screen appears, which asks the user to "Mount disks and press return." This procedure allows the text and data files to be stored on a different disk from that holding the programs. Since the programs are reasonably short and don't take up much disk space, this is rarely necessary, and the user usually just hits the return key.

EDIT uses two basic screens: the command screen and the text screen itself. The command screen (a sample is shown in Table 1) displays the files being manipulated, the total memory in the system, how much is being used and how much is available, the current mode, the line width for the display, and the columns currently used for tab stops. The Mode is usually "Text" for normal editing, but special modes are available for editing special files with default parameters different from normal text such as programs.

Various editor commands can be entered when the command screen is displayed, but we will come back to these after examining the editor itself.

The editor is simple and to the point, but behind this simplicity lies some careful design work. Editing is done on a full-screen basis. This sounds obvious, but the Magic Wand allows the cursor to move *anywhere* on the screen, even including areas where there is no text. Most word processors store text as a continuous stream of characters, and therefore do not allow the cursor to move into screen areas which appear available but in which no text is stored. The first-time user may not appreciate the difference, but Magic Wand's approach makes editing easier and more natural. *(The popular "Electric Pencil" shares this trait. —Ed.)*

The editing control keys are shown in Table 2. Note that the commands shown are customized for my system, and will vary from version to version. The cursor can be moved in any direction a character at a time, to the right by tab stops, back to the beginning of a line, the upper left screen position with the HOME key, or to the beginning or end of the text. The display can be scrolled in either direction either a line or a screen at a time. (The screen has to be re-written for negative scrolling, which can be a bit slow. This is unavoidable with serial terminals but is a bit surprising with memory-mapped video.)

With any of these commands, the imbedded character which turns the feature on and off can be changed by the user.

Text is normally entered without carriage returns, and Magic Wand employs word wrap to move words which won't fit on a line down to the next line automatically. Carriage returns are used only at the end of paragraphs or for blank lines, and are indicated on the screen by a tilde (~). Overwrite mode is standard, which means that a character entered simply replaces the one under the cursor.

Two methods of inserting text are available. The INSERT key inserts text at the cursor position, pushing characters to the right to make room. Insertion continues until some non-text key like a backspace, scroll, etc. is pressed. There is no indication that the program is in insert mode other than the behavior of the text on display; either a change in the cursor appearance or some flag might have been nice. Insertion of more than a few characters is generally handled better by use of the FULL INSERT key. In the full insert mode, the screen is cleared from the cursor position to the bottom of the screen except for one line of text. The new text can then be entered without movement on the screen which can be confusing. After all the new material is added, END INSERT fills in the rest of the screen with the subsequent text.

Character deletion is straightforward, with following characters moving to the left as deletions are made. The LINE DELETE key removes all text to the right of the cursor on a line; if the cursor is on the left edge of the screen, the entire line will be removed. As a thoughtful safety measure, the LINE DELETE key must be pressed *twice* to take effect, so an accidental depression of this key will not result in a lost line.

The program permits single or multiple searches or searches with replacement. When the SEARCH key is depressed, the cursor moves to the bottom line of the screen and the search and replacement string, if any, are entered, separated by a colon. The number of repetitions can be indicated by another colon followed by a number or a return to indicate replacement of *all* occurrences. After the operation is performed, the

TABLE TWO

REFERENCE CARD

IMSAI VDP-80
EDIT CONTROL KEYS

STANDARD FORMAT

Up Cursor	Up arrow
Down Cursor	Down arrow
Left Cursor	Left arrow
Right Cursor	Right arrow
Tab	TAB
Home	HOME
Backspace	BACKSPACE
Forward Line Scroll	Control X
Backward Line Scroll	Control E
Foward Page Scroll	Control C
Backward Page Scroll	Control R
Top of Text	Control V
Bottom of Text	Control B
Character Delete	DELETE
Line Delete	Control N
Character Insert	INSERT
Full Insert	Control O
End Insert	Control Y
Search/Replace	Control G
Repeat Search	Control F
Block Marker	Control U
Page Feed	Control P
Visible Line Feed	Control Z

TABLE THREE

EDIT COMMANDS

R	Read file into memory
R n	Read n lines into memory
W	Write entire file in memory to disk
W n	Write n lines to disk
WC	Write to cursor to disk
L n	Set line length at n characters
T n	Set tab markers n spaces apart
T n1,n2,...	Set tab markers at specific columns
BC	Copy block to cursor position
BM	Move block to cursor position
BD	Delete block
BK	Kill all blovk markers
P	Print text in memory
PB	Print block of text
P n or PB n	Print with left margin of n characters
D filename	Display file
I filename	Establish file as Include file
I	Begin Include sequence
I@	Reset Include file to beginning
S filename	Establish file as Print file
S	Begin printing file in background
SX	Stop printing file in background
MT	Change to Text Mode
MP	Change to Program Mode
MA Y/N	Automatic wordsplitting, yes/no
MB Y/N	Blank Packing, yes/no
MC Y/N	Display carriage return, yes/no
END	End EDIT, save edited file
QUIT	Quit EDIT, kill edited file
QUITX	Quit EDIT, save file as $$$ file type

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What versions are available?	TRS-80, APPLE II COMMODORE PET MICROSOFT,CBASIC2 CP/M_R MICROPOLIS: EXIDY SORCERER, VECTOR MZ, DYNABYTE CROMEMCO III	WANG CBASIC2 CP/M_R	MICROSOFT CP/M_R	CBASIC2 CP/M_R
What is the price?	MICROLEDGER, A/P, A/R, INV, PERS: $140.-each. MAXILEDGER, ORDER ENTRY $350.-each.	One-time dealer cost: $250 each. Suggested book price: $20 each, without machine-readable code.	GL, A/P, A/R, PAYROLL, INVENTORY $1000 each.	GL $995.- A/P $750.- A/R $750.- INV. $500.-
Hardware options	40 column CRT 64 column CRT 80 col. terminal 80 col. printer included	64 col. CRT or terminal minimum. 132 col. printer.	80 col. CRT only 132 column printer only	cursor addressable terminal only 132 column printer only.
Is source code included?	YES, INCLUDING PROGRAM FLOWCHARTS.	YES	YES	NO
What type of after-purchase support is offered?	1 YR WARRANTY & CORRECTION OF DEFECTS THROUGH DEALER. INDIVIDUAL PROGRAM AUTHORS AVAILABLE FOR QUESTIONS.	DEALER IS RESPONSIBLE FOR SUPPORT.	1 YR WARRANTY & CORRECTION OF DEFECTS THROUGH DEALER.	TECHNICIANS AVAILABLE FOR QUESTIONS. UPDATES MADE AVAILABLE FOR A FEE.

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Wand, cont'd...

system indicates the number of replacements done.

If no search string is specified, the program looks for the next occurrence of an exclamation point. This doesn't sound like much, but the manual demonstrates how to set up template letters (in which, for example, only the date and addresses have to be changed) by placing exclamation points where the insertions are to be made. Searching for the next one automatically positions the cursor to the point of the next insertion. Simple, easy and powerful!

Searching is done from the cursor forward only, so global replacements require the cursor to be moved to the beginning of the text. To selectively replace only certain occurrences, a single replacement can be made and the REPEAT SEARCH key used to move to the next occurrence. No provision is made for wildcard or special matching characters, case-independent replacements, or whole word only replacements (although this can sometimes be simulated by surrounding the desired word with spaces when specifying the search or replacement string).

Amusingly, the student is presumed to be Abraham Lincoln's secretary, and early drafts of the Gettysburg Address and various letters are supplied as sample text.

Line feeds can be inserted into the text; this is rarely if ever used in normal material but is handy for formatting Microsoft Basic lines. A page feed character (which appears on the screen as a caret (^)) can also be inserted, and serves as a form-feed indication during printing, and also in the special INCLUDE feature described below.

Blocks of text are delineated with the BLOCK MARKER key. An underline character appears on the screen to indicate the marker, but this is *not* actually an underline. As with most word processors, blocks can be moved, copied to other locations in the text or deleted.

Other editing commands (listed in Table 3) are entered from the command screen described earlier. Hitting the ESCAPE key shifts between the normal text screen and the command screen. Provision is made to read or write either entire files or a specified number of lines, changing the number of characters in a line when printing it on the screen or printer. (Note that word wrap is not operative when displaying or printing from EDIT, so this feature is only useful for checking files; the PRINT module must be used for actual finished printing.) For the command screen you may also display a directory of files on any active drive, change mode for entering programs or special material, rather than normal text, change the default tab settings, initiate block moves, copies or deletions, or exit the EDIT program.

LISTING ONE

Sample Form Letter

```
\LM5,RM55,COPY0~
\SET ADDR1=" "~
\SET ADDR2=" "~
\SET ADDR3=" "~
\SET ADDR4=" "~
\SET ADDR5=" "~
\GET ADDR1,GET ADDR2,GET ADDR3,GET ADDR4,GET ADDR5~
\GET COPIES="Enter Copy recipients:~
\GET SALUT="Enter SALUTATION (Including ending punctuation):~
\TEXT~
Dear \:SALUT,TAB35\February 22, 1980~
~
This is the actual text of the sample letter. Note that the
inside address and copy recipients line follow the signature
in the format used.~
~
This version requires the operator to enter the necessary
address, salutation and copy recipient information before
each letter is printed.
~
Sincerely,~
~
~
Glenn A. Hart~
~
~
\:ADDR1\~
\:ADDR2\~
\:ADDR3\~
\:ADDR4\~
\:ADDR5\~
~
cc: \:COPIES\~
~
GAH/nes~
\NP~
```

Note that files can be printed while editing is in progress. This *background printing* is a form of multi-tasking, and can be a real time saver. (As mentioned above, the file will not be formatted correctly unless it was printed to disk in a formatted version.) As with most such spooling schemes, keyboard response is somewhat degraded, although a patch can be made to the BIOS of many CP/M systems to improve performance in the background printing mode.

Many word processors allow reading text from disk to the location of the cursor. This allows preparation of stock paragraphs which can be inserted into letters, reports, etc. While Magic Wand can handle such 'boilerplate' in the same way, it also has an extremely powerful and simple-to-use special method. A file can be specified as the "Include File," and predefined segments of the file can be examined and incorporated into the main file on a selective basis. Alternatively, each segment can be labeled when the file is constructed, and any segment can be added directly to the main file without intermediate steps. This mechanism can also be used to construct 'Help Files' to be used for reference instead of text generation. Such files can provide clerical staff with information on computer procedures, sales policies, etc.

All in all, the basic editor is straightforward, easy to use and easy to learn, but with deceptive power and flexibility. Obviously there are several enhancements which would be helpful, such as on-screen formatting, the ability to move around a word at a time, deletions of words in either direction, use of reverse video or dual intensity, pattern matching, whole word only, wildcard characters and case conversion in the search and replace mechanism, etc., but these might come at a high cost in both simplicity of use and memory requirements.

Imbedded Commands

The real power of Magic Wand comes from a very extensive set of commands which can be imbedded in the text or issued when the file is printed. The normal procedure is to place the commands at appropriate points in the text, very much like a free-standing text output processor program.

A complete listing of the available commands is shown in Table 4. These commands can be placed *anywhere* in the text, not just in the leftmost column. The normal command indicator is the backslash (\), but this can be changed with the CMD command.

Several of the commands perform straightforward formatting of the page layout to be used. Many such commands take either a character or a numeric parameter which represents a column number or the number of lines involved. A numeric parameter can sometimes be either a positive or negative number to show increments or decrements in the parameter value. Some commands have default parameters which will do a good job on standard text, even if no specific command is given. Left, right, top and bottom margins can be set, line spacing varied (or momentarily disabled for special functions), temporary indentations established, paragraph indentation set (auto-

matic indentation by a specified number of columns of the first line of copy following a carriage return), insertion of 'ghost hyphens' used to split words if they happen to print at the end of lines, etc.

Both flush-left (as in normal typing) and flush-right formats are available. Flush right is useful to line up text on the right margin for headings and special purposes. A literal mode is also provided to disable formatting features for charts and tables. Magic Wand is one of the few word processors to allow multiple line headings and footings in any user-defined format, an important advantage in many business environments. Pagination is flexible, individual lines or groups of lines can be centered, formfeeds can be inserted (either a formfeed character if the printer supports this feature or a series of line feeds if it does not), an 'ignore character' which the printer will disregard can be specified for skipping around in the text, sending special control codes to the printer, etc.

Several forms of justification are possible. With a standard printer, Magic Wand will insert blanks to right justify the line, but with specialty daisywheel or thimble printers other options are available. JUST inserts microspaces between words, while JUSTC uses a character spreading algorithm. Proportional spacing is also possible with appropriate print wheels, although this feature is not extensively documented in the first release.

Specialty printers are capable of various precision printing modes, and Magic Wand supports them all. CPI determines the number of characters per inch, and defaults to 10 for normal pica-sized printing. The H command can also be used for this function to directly specify the number of 1/120" increments to be used between characters.

The editor is simple and to the point, but behind this simplicity lies some careful design work.

Magic Wand is also the only program I have seen to incorporate a feature known as 'kerning,' which is evidently a typographer's term for altering the spacing between given letters to improve the appearance of unusual words. Spacing between lines can also be modified to precise values other than the normal six lines per inch with the LPI command, by setting a half-line value with the SP command, or by directly specifying the vertical increment with the V command.

Underlining (both solid and only under characters) is provided, as are boldface, with variable intensity (number of repeated overstrikes) and superscripting and subscripting. With any of these commands, the imbedded character which turns the feature on and off can be changed by the user. These specialty printer functions can be disabled for printing with a standard printer by the DRAFT command. This is convenient if you have, as I do, both a high-speed and a daisy-wheel printer.

High-Level Language Features

Perhaps the most powerful and unique aspect of the Magic Wand is its inclusion of many commands which are similar to high-level language statements. Display of messages, input of data from the operator, numeric, string, and system variables, conditional commands, comparison operators and variable-length disk data files are all supported. This is very much like having the Basic statements PRINT, INPUT, LINE INPUT, LET, GOTO, IF/THEN, TAB, LEN, GET/PUT and others built into the word processor!

TABLE FOUR

PRINT COMMANDS

LM n	Left margin of n characters
RM n	Right margin n characters from Left Margin
IN n	Indent n characters
PI n	Paragraph indentation of n characters
PL n	Page length of n lines
TM n	Top margin of n lines
BM n	Bottom margin of n lines
LEFT	Flush left format
RIGHT	Flush right format
LIT	Literal format
JUST	Justify using blank insertion
JUSTC	Justify using character spreading
PROP	Proportional spacing
CENTER	Centering format
CTR	Center current line
CPI n	Pitch of n characters per inch
H n	Horizontal movement of n increments per character
K n or -n	Add or subtract n increments to next character
LPI n	n lines per inch
SP n	n spaces between lines
SP+ n	n and a half spaces between lines
SP 0	Inactivate line feed
V n	Vertical movement of n increments per line
CMD c	Set c as command marker
HY c	Set c as ghost hyphen symbol
UN c	Set c as underline symbol
UNB	Broken underlining
UNS	Solid underlining
BF c	Set c as boldface symbol
BF n	Set n (1-9) as boldface intensity
BF 0	Turn off boldface
SSA c	Set c as superscripting symbol
SSB c	Set c as subscripting symbol
IGNORE c	Establish c as Ignore Character
OUT n1,n2...	Output series of numbers to printer
FORMC	Continuous form paper
FORMS	Single sheet paper
DRAFT	Inactivate specialty printer features
COPY n	Process n copies of file
COPY 0	Process indefinite number of copies
PG n	Set current page at n
LINE n	Move down to line n
LINE -n	Move up to line n
TAB n	Move to column n
SETUP	Indicates start of initial setup section
TEXT	Indicates end of initial setup section and beginning of text
NP	New page
NL	New line
FF	Form feed
FORMFEED ON/OFF	Turn on.off mechanical formfeed
START n	Start processing at nth record/page
STOP n	Stop processing at nth record/page
END	End current pass
QUIT	End job
GET var	Go to keyboard for value of variable
GET var="Prompt"	Print prompt on screen
SET var="String"	Set value of var as String
SET #var = n	Set numeric value of var as n
FILE Tn,filename	Set file as Text File with n elements
DATA v1,v2,...	Assign elements to variables
FILE Fn,filename	Set file as Fixed File n characters long
DATA v1(n1),...	Assign n characters to variables
=var	Print full length variable
:var	Print variable truncated to last non-blank character
$var	Print variable in dollar (decimal) format
DECIMAL P/C	Change to American/International decimal format
#var	Print variable in numeric format
&var	Print truncated length of variable
IF	Beginning of conditional statement
IF NOT	Alternate conditional statement
SKIP	Skip one line of text file
SKIP n	Skip n lines of text file
SKIP TO c	Skip to next occurence of c
HEAD n	Define next n lines as heading
FOOT n	Define next n lines as footing
PRINT ON/OFF	Turn printer on/off
DISK ON/OFF	Start/stop saving output on disk
DISK filename	Start saving output on disk under filename
VSIZE n	Set n as maximum number of variables
HSIZE n	Reserve n characters in memory for heading
FSIZE n	Reserve n characters in memory for footing
*	Internal note - not printed on screen
NOTE	Note printed on screen
WAIT	Go to keyboard for command
SHOW	Show on screen value of specific variable
DS	Display Status
DV	Display value of all variable
DF	Display value of file variables
DB	Display size of buffers
CLS	Clear screen

LISTING TWO~

```
                More Complex Form Letter~
~
\SETUP~
\CLS~
\NOTE This program prepares form letters using the CLIENT.DAT file.~
\LM5,RM55,COPY0~
\GET DATE="Enter today's date:"~
\FILE T10,CLIENT.DAT~
\DATA ,NAME,ADDR1,ADDR2,CITY,STATE,ZIP,SALUT,COPIES~
\TEXT~
\IF %EOF=0,SKIP 7~
\NP~
\CTR\Form Letters Sent~
~
\CTR,:DATE~
~
\=#COUNT\ letters were sent to clients stored in the CLIENT.DAT file.~
\FF,QUIT~
\SHOW "Pass ",%PASS," Name: ",:NAME ~
~
Dear \:SALUT,TAB35,:DATE,NL~
~
This is the actual text of the sample letter. Note that the
inside address and copy recipients line follow the signature in
the format used.~
~
This version runs without operator intervention, printing a
letter for each record in the data file and displaying the pass
number and recipient as each letter is printed. At the end of the
job, a summary is displayed showing the total number of letters
printed.~
~
It would be easy to send letters only to specified classes of
clients by including a code field in the data file and using a
conditional statement to print letters only to recipients with
certain codes.~
~
Sincerely,~
~
~
Glenn A. Hart~
~
~
\:NAME,NL~
\:ADDR1,NL~
\IF ADDR2<>" ",:ADDR2,NL~
\:CITY\, \:STATE\ \:ZIP\~
~
cc: \:COPIES\~
~
GAH/nes~
\SET #COUNT=#COUNT+1~
\NP~
```

The uses of these commands vary from rather-simple-but-useful up to extremely-complex-and-powerful. For example, I recently had to send identical letters to clients, with each letter varying only in the salutation, inside address and copy recipients. As an illustration of Magic Wand's power, two examples of a similar hypothetical letter follow.

The simpler text file is shown in Listing 1. The general approach is to have the operator supply the variable information before each letter is printed. The salutation, address lines and copy line are set up as string variables (which are preceded by a colon). The COPY 0 command causes repetitive execution, asking the operator after each letter if he or she wishes to proceed to doing another one. The salutation and date appear on the first line of the letter. CLS clears the display screen, NL forces a new line. The NOTE command displays text on the operator console, while GET VAR = "Prompt" prints a prompting message and then receives the value of the specified variable from the keyboard, much like LINE INPUT "Prompt," VAR in Basic. Flush-left printing is specified, since justification tends to make a letter look computer generated and is not generally desirable in business use.

Note that the date in this version was actually in the text itself. If the same letter would have to be sent some other time, the SETUP/TEXT commands could be used to establish a body of commands preceding any text which would be used only during the preparation of the first letter. The date could be requested in this section and would not have to be asked for again. In Listing 2, this method is used.

If no search string is specified, the program looks for the next occurrence of an exclamation point.

Listing 2 also demonstrates the use of *data files.* Magic Wand allows definition of variable or fixed length data files with any number of data items in each record. The FILE command specifies the name of the data file (which must have been prepared previously) and how many data items are included in each record. DATA assigns a variable name to each item which can then be used in the text file. Note that not all elements of each record must be used in any given application; commas are used to skip over unused items. This allows a comprehensive data file to be established with complete information on all clients. It is easy to write a Magic Wand file to help in this process; the file which is created is simply printed to disk (with the DISK ON command) rather than to the printer. A sample of the data file for this job is shown in Listing 3.

LISTING THREE

```
        Sample Data File

RECORD #1~
Mr. John Bigshot~
Amalgamated Industries~
123 Broadway~
Anywhere~
N.Y.~
10000~
Mr. Bigshot:~
Harry Flack, George Associate~
~
RECORD #2~
Mr. Thomas Smith~
Smith Associates~
~
Suffern~
N.Y.~
10901~
Tom,~
Mary Smith~
```

Version 2 introduces the use of *system variables.* Seven such variables are maintained by the program, including the current page number, pass number, record number, line number, and column number. The number of lines from the bottom of the page is available, as is an end-of-file flag to test for the end of data files. Combining these variables with various conditional tests can result in quite sophisticated controls. A conditional statement is used to test for an empty third address line; if the line is empty the program skips to the city/state/zip line without printing a blank line.

This version also adds a management report at the conclusion of the job showing the number of letters printed. The Magic Wand manual shows a much more complicated example, which keeps track of the size of contributions, the number of different types of responses produced, etc. All this can be done through use of system variables, user-defined counter variables and conditional branching.

With this version, operation is totally automatic once the date is supplied. Single sheet letterhead was used, but with either continuous forms or letterhead tipped onto computer forms the entire job would be completed without operator intervention. Envelopes can also be tipped onto forms, usually over the printed letterhead area, and the Magic Wand text file can easily print the envelopes in the same pass.

The Print Program

When PRINT is invoked, the user is given a chance to mount different disks, as in EDIT. The program then prompts with a backslash. At this point, hitting RETURN will start printing, using either default settings for page layout or the values imbedded in the text itself. Any imbedded commands will be executed, including all the prompting, operator

input requests, data file accesses, etc. described above.

When the backslash prompt is displayed, valid formatting commands can be given to change the value of a formatting parameter. The new value will be used unless a command imbedded in the text overrides it. If the user enters DS for

Design of more complex jobs is far less simple, and I feel that some experience in programming is a definite plus if not a requirement in extracting the maximum benefit from the program.

Display Status, the screen shown in Table 5 appears. The current values for all important formatting variables, the current position in the file, the current values of the various recognition characters, etc. are displayed in an excellent format. Commands can be entered continuously to change these values, until a simple RETURN starts printing. Since printing can be interrupted at any time by hitting the space bar on the console, printing parameters can be modified during mid-run if desired.

TABLE FIVE

```
                        Print System Status          Pass 1

 Input File DEMO.TXT

 Format Left Flush      Printer: Diablo 1650
 PL - Page Length 66    Diskout:                 # Variables  0
 TM - Top Margin  0     Forms     Continuous     Ignore Char
 BM - Bottom Marg 6     Lines/In  6              Cond. Hyphen &
 LM - Left Margin 10    Chars/In  10             Underscore     Solid
 RM - Right Marg  60    Page      1              Boldface       @ Intensity 1
 IN - Indentation 0     Line      0              SSA (Above)    {
 PI - Para Indent 0     Column    1              SSB (Below)    }
 SP - Spacing     1     Source    Text           Command Mark   \
```

Other print-time commands can display the value of various variables and the size of various buffers, start or stop printing at specified page numbers, end processing, etc. Formatted output can be sent to either/or both the printer or to a disk file for later printing in the background mode. If the text file includes commands to SHOW the value of variables, the screen can be made to display the pass number or other useful data while the file is printing.

Summary And User Evaluation

Even with the lengthy explanations and examples I have provided, I have not covered all the possible uses of the Magic Wand. The high-level language features make it possible to perform almost any conceivable word processing job.

Preparation of day-to-day business correspondence and reports is simple and easy to learn, due to the basic simplicity of the editor and the well-chosen default settings for the PRINT program. Personal experience has shown that secretarial staff take to the system quite readily and can begin to use the program quickly and efficiently.

Design of more complex jobs is far less simple, and I feel that some experience in programming is a definite plus if not a requirement in extracting the maximum benefit from the program. The ability to structure extremely powerful programs that are easy to use by clerical personnel well repays the effort expended, especially for legal offices and other business environments where repetitive but variable letters and contracts are commonplace. The Magic Wand is one of the most flexible word processing packages available, and should be considered by any potential word processing purchaser. □

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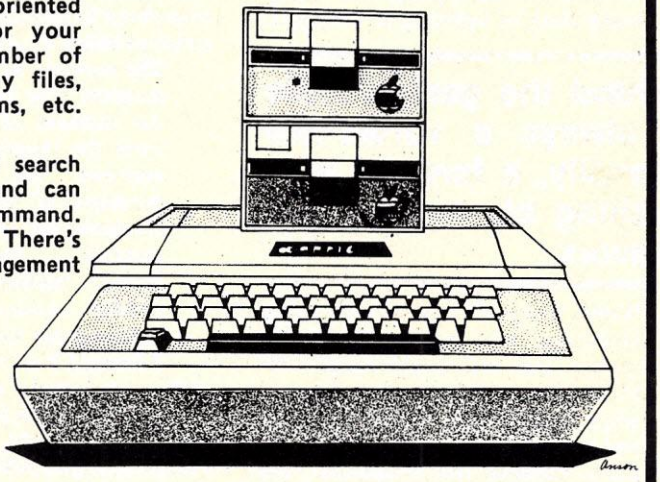

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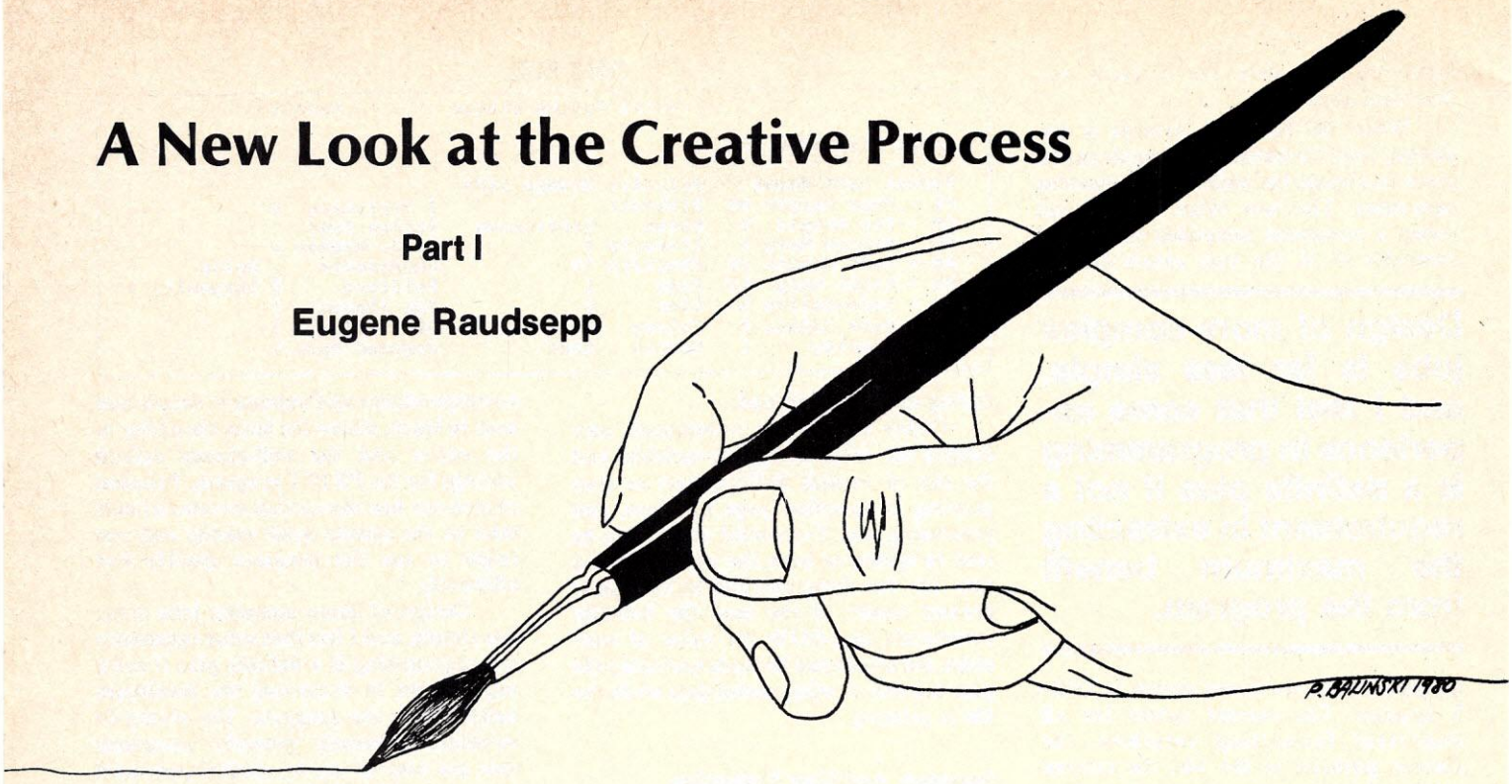
A New Look at the Creative Process

Part I

Eugene Raudsepp



If you would intuit, get intuit. — Ed.

One of the most persistent notions about creative ideas is that they come in a flash-like and spontaneous fashion. Perhaps one of the best metaphorical descriptions of the sudden, flash-like birth of the creative idea comes from the contemporary composer, Paul Hindemith. Although written about musical composition, his apt metaphor describes equally well how *some* creative conceptions occur in science, engineering, and invention.

We all know the impression of a very heavy flash of lightning in the night.

Behind the genius there is always a vortex-like intensity, a forceful plan pushing his creative endeavors.

> Within a second's time we see a broad landscape, not only in its general outline but with every detail. Although we could never describe each single component of the picture, we feel that not even the smallest leaf of grass escapes our attention. We experience a view, immensely comprehensive and at the same time immensely detailed, that we never could have under normal daylight conditions, and perhaps not during the night either, if our senses were not strained by the extraordinary suddenness of the event. . . . Compositions must be conceived in the same way. If we cannot, in the flash of a single moment, see a composition in its absolute entirety, with every pertinent detail in its proper place, we are not genuine creators.

Psychologist L. L. Thurstone also regarded the dramatic and sudden moment of insight or illumination as characteristic and critical in creative conception. He considered insight to be the main key to the entire problem of invention:

> The moment of insight is the critical moment. The thinking that precedes the moment of insight is different from the thinking that follows that moment. We might define the moment of insight as the main characteristic of work that is called creative. . . . The act is creative if the thinker reaches the solution in a *sudden closure* which necessarily implies some novelty for him.

Although it is true that some creative ideas, solutions to problems and inventions, undoubtedly owe their existence to spontaneous insight, a closer study of the creative process indicates that most ideas do not issue from a full-blown, precisely delineated and firmly structured insight. Neither is the subsequent process of forming and developing the idea always a spontaneous flow of suggestions from the unconscious, reducing the creative individual to a passive transcriber of dictated ideas.

The dramatic instance of a sudden illumination that enables the creative engineer to perceive the entire novel idea, process or device is in reality a rare and over-publicized phenomenon, grossly exaggerated in the accounts creative individuals themselves have left behind. It is even more unfortunate that this romanticized exaggeration about the sudden complete vision of a new invention, product or idea has become a firmly rooted notion among our own contemporary investigators and writers on creativity. The perpetuation of this notion can only convince those who fail to experience such apocalyptic visions that they really do not have creative talent, when, in fact, they may have it to a considerable degree. There is also little doubt that this notion has dissuaded many budding and promising creative engineers from whole-hearted application of their talents. It would, perhaps, be encouraging for them to know that the ideas that have been developed into completed forms are seldom conceived minutely and clearly right in the beginning of the creative process. The

The individual often loses respect for the person initiating the attack. He soon refrains from suggesting anything at all.

Eugene Raudsepp, Princeton Creative Research, 10 Nassau St., Box 122, Princeton, NJ 08540.

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New Look, cont'd...

creative idea, with only rare exceptions, is initially anything but sharp and sustained, issuing effortlessly into expression. If it really were so, it would reduce the creative process to a noncreative mechanical copying of all the elements that were presented to the creative person at the moment of a single, comprehensive insight. As will become apparent, the process of creating is anything but mechanical or passive copying.

He cannot view the finished product with the same ardor or feeling as the act of creation. The felt value of the idea usually abandons the creative individual at the completion of his work.

Close scrutiny of the creative process shows that what occurs during the act is a slow, selective structuring of an idea that is initially only imperfectly intimated, and which follows the dictates of an intuitive feeling of what belongs and what does not belong, what is proper and what is not. It is a gradual, frequently elusive and groping clarification of a dim and vaguely perceived idea. Perhaps the best way to illustrate this process is through a metaphor.

Let us imagine that we stand at a shore on a foggy day and see a ship sailing in the distance, shrouded by a low, shifting, overhanging fog. Fixing our eyes on the probable course of the ship, we may alternately catch a glimpse of a piece of the white sail, or the top of the mast, or the surging prow. The whole thing is never in full view, yet we know that it is there, and eventually we can construct an image of the entire ship. In a similar fashion, an individual in the beginning of the creative process *senses* the total structure of his idea when only a limited number of details of the new emerging configuration are clearly perceived and delineated. He starts elaborating on the single detail or piece of an overall idea he perceives, and this process of elaboration and shaping of the detail helps other details to emerge. Provided critical judgment is held in abeyance, these details often fall into their proper places spontaneously. Thus the initial idea, rather than being a comprehensive survey of the whole new conception, is often merely a fragmentary particle of the total new idea still to emerge. Although some intuitive anticipation of the original total concept has to occur in the beginning, it is the process of shaping the elusive, fragmentary insights that actually brings it into being. However, the shaping of a new creative product may proceed with unflinching orientation and discrimination even if an awareness of the total meaning of the new idea is not conscious or is only imperfectly so. Nevertheless, the implicit total idea or concept controls the entire creative process — so much so, in fact, that it is impossible for the creative engineer to impart elements into the evolving idea that do not jibe with the commanding *gestalt* of the original conception.

It is the *intuitive sensing* that serves as the all-important measure of the elements to be incorporated into the creative product, and not an all-embracing insight. William J. J. Gordon of Synectics, Inc. has empirically observed intuition *in vivo* with his invention design group. According to him, "intuition is an inner judgment made by the individual about a concept relative to a problem on which he is working. . . . The individual with good intuition is the one who, beyond what could be expected from mere probability alone, repeatedly selects the viewpoint which turns out to lead, for instance, to a great painting or an important invention."

In a vital sense, the creative process can be considered as a movement: from the amorphous, dimly and vaguely perceived idea toward a more intelligible structure as the work progresses; from obscure, incommensurable inwardness toward resolved and tangible clarity; from the implicit toward the explicit; from the vaguely intimated toward the known; from the dimly intuited and chaotic toward the reasoned and organized; from the vague meaning toward the clear meaning; from the separate existing paradoxes and contradictory components toward a resolved, unified and logical structure. The emergence of the idea is gradual, and it is only by virtue of the creative exercise during forming that the individual finally succeeds in securing the elusive idea.

Suspending Critical Judgment

The acceptance of proposals as they emerge from the unconscious while one is actually working on an idea is a delicate thing. One has to resist the increasing pressure of criticism and judgment that the progressively articulated portions of the idea inevitably elicit. For nothing can inhibit and stifle the creative process more — and on this there is unanimous agreement among all creative individuals and investigators of creativity — than critical judgment applied to the emerging idea at the beginning stages of the creative process. Critical judgment early in the process will inhibit, if it does not completely shut off, the forward propulsions of the emerging idea.

© Creative Computing

"John! Your scatter plot is scattering!"

A total loss of consciousness of what is going on, or the unconsciousness of the act of creation occurs only during a trance-like absorption of the whole personality in the inspirational flow of ideas.

This does not mean that criticism, judgment and evaluation have no place in the production of new ideas. On the contrary, these functions serve a very useful purpose. But they serve their purpose at the conclusion of the process, when an open and objective assessment of the idea should be attempted and any pride of paternity suppressed. During the heat of the creative shaping and forming of the idea, however, criticism and judgment must be suspended. The individual should only be aware of the suggestions that emerge from his unconscious. No single item that occurs should be pinpointed in the center of attention, for this might inhibit further development of the idea. In a sense, the creative person first *feels* his idea, rather than *thinks* or *conceptualizes* it. As Brewster Ghiselin has pointed out, "one must learn to seize and hold them (the initial ideas) without insistence, letting them agitate the mind when and as they may and make their own development, relinquishing them as they fade or fail of effect and taking up others to be cherished without attachment in the same way, shaping the expression of the growing insight critically — that is, consciously and rationally, drawing upon all resources of craft and understanding — *insofar as that may be done without arresting spontaneous development, always preserving the stir of the excited mind* out of which the development issues."

Many creative individuals have indicated how very important it is to be unself-consciously absorbed during the creative process. For example, composer Aaron Copland offers the following advice, which, in principle, applies to creativity in almost every other field: "Inspiration may be a form of supercon-

sciousness, or perhaps of subconsciousness — I would not know; but I am sure that it is the anithesis of selfconsciousness. The inspired moment may sometimes be described as a kind of hallucinatory state of mind: one half of the personality emotes and dictates while the other half listens and notates. The half that listens had better look the other way, had better simulate a half attention only, for the half that dictates is easily disgruntled and avenges itself for too close inspection by fading entirely away."

The contemporary poet Richard Wilbur reminds us of Baudelaire's notion that the creator must be "hypnotist and subject at the same time." "This is ticklish business," says Wilbur. "You have to give the unconscious free play, and at the same time shape the proposals of the unconscious into something that makes daylight sense."

The idea arrives brimming with positive feeling, which gives the creative thinker a poignant sense of certainty concerning its relevance to the problem he is tackling.

Similarly, the great poet-philosopher Frederick Schiller in 1788 warned, in an historic letter to a friend who complained of a lack of creative power, that the intellect should give a wide berth to the incipient ideas in the beginning of the process: "Apparently it is not good — and indeed it hinders the creative work of the mind — if the intellect examines too closely the ideas already pouring in, as it were, at the gates. Regarded in isolation, an idea may be quite insignificant and venturesome in the extreme, but it may acquire importance from an idea which follows it; perhaps in a certain collocation with other ideas, which may seem equally absurd, it may be capable of furnishing a very serviceable link. The intellect cannot judge all these ideas unless it can retain them, until it has considered them in connection with the other ideas. In the case of a creative mind . . . the intellect has withdrawn its watchers from the gates, and the ideas rush in pell-mell, and only then does it review and inspect the multitude." And James Thurber declared: "Be a guardian not an usher at the portal of your thought."

Many engineers fail to maximize their creative performance because it is hard for them to entertain the elusive and vague thoughts present during the early stages of the creative process. The indefinite, shapeless and disorderly state of mind and the incipient confused excitement that creative activity engenders are something from which they ordinarily flee. Because of the concrete and practical background of their education and experience, they need a well-defined and clearly blue-printed purpose in view to move with concentration, energy and courage toward a goal.

Critical attitude, according to several psychologists, seems to be the engineer's most notable personality trait, and it colors almost all of his perceptions. The noted industrial psychiatrist Dr. Charles E. Goshen, feels that the hyper-critical attitude, the trigger-ready tendency to judge, stems from the engineer's head to 'always be right' and his extreme sensitivity to criticism. Dr. Goshen believes that the engineer's self-esteem, his self-image and pride hinge largely on his success in avoiding criticism. Consequently, as a defense mechanism, he criticizes approaches to technical problems, as well as people, with equal fervor. This tendency to be overly critical is usually also directed inward, toward the engineer's own thought processes. Consequently, it may well be one of the most negative factors in thwarting creative problem solving.

One of the primary reasons why judicial thinking and creativity make uncomfortable bedfellows is that criticism is based on what is already established, accepted or proved. Critical judgment must have recourse to past experience, precedent and facts — everything that is in the past tense. Being a past-oriented way of thinking, it is essentially opposed to the novel, the untried and the original. Where creative advance is concerned, the past serves only to a limited degree as a guidepost. Of itself, however, it is incapable of either bringing the new idea about or predicting what would happen if it were developed. The knowledge of what already exists also involves a stereotyped orientation. None of the unexpected new combinations, contrasts, balances and configurations of the elements in a creative idea in its formative stage meet the requirements of established laws, facts or logic. A new creative idea is, of course, based on available knowledge, but it does not issue from it by any direct rational or logical process.

We have elevated logic and reason to a level where they stifle creative thinking. This has been pointed out by consultant Dr. A. R. Wight. He states: "Perhaps one of the chief forces that inhibit creativity is the emphasis on logic and reason and the lack of respect for intuition. Logic can destroy creativity if demanded or applied too soon, because a creative idea very often is a product of intuition, and the logic supporting it must be developed. Unfortunately, many people in industry have come up through schools where 'rule and reason' prevail. They thus feel that nothing is worth consideration that cannot be defended by logic."

Failure to suspend judgment and consider a range of alternatives frequently results in early commitment to an approach that may contain a 'restrictive error' or an 'incorrigible strategy.' In the perceptual laboratory, for example, subjects who make an early, incorrect interpretation of a picture in an 'ambigumeter' (a device that gradually brings a blurred picture into focus), tend to retain the wrong perception. They fail to 'see' — even when the picture has been fully and clearly exposed.

The most creative engineers engage in undisciplined, open-minded, and uncritical thinking in the initial stages of the problem-solving process. This has been reported by Gary A. Steiner of the University of Chicago. He states: "Highs (highly creative engineers) often spend more time in the initial stages of problem formulation, in broad scanning of alternatives. Lows (less creative engineers) are more apt to 'get on with it.' . . . For example, in problems divisible into analytic and synthetic stages, highs spend more time on the former — in absolute as well as relative terms. As a result, they may leapfrog lows in the later stages of the solution process. Having disposed of more blind alleys, they are able to make more comprehensive integrations.

The intuitive moment is also frequently accompanied by a sense of compulsion that urges the creative individual to do something right away about the idea.

"Creativity is characterized by a willingness to seek and accept relevant information from any and all sources, to suspend judgment, defer commitment, remain aloof in the face of pressure to take a stand."

Professor Steiner points out, however, that after the initial, open-minded, idea-getting phase, and the examination of many alternatives, the creative engineer exercises critical judgment. He selects the alternative he feels is potentially the best. In the developmental stage a bull-headed conviction about the idea's merit takes over. In professor Steiner's words: "Initially there is an open-minded willingness to pursue leads in any direction, a relaxed and perhaps playful attitude that allows a disorganized, undisciplined approach, to the point of putting the problem aside entirely. But at the point of development and execution, where the selected alternative is pursued, tested, and applied, there is great conviction, even perseverance, perhaps strong personal involvement and dogmatic support of the new way."

Other increasing experimental evi-

New Look, cont'd...

dence also indicates that a constructive, rather than a critical or negative, approach to ideas produces more creative solutions. Dr. Ray Hyman conducted several experiments at General Electric and at the University of Oregon. He compared a positive (or constructive) set and a negative (or critical) set toward both common and uncommon ideas for solutions of a problem. According to him, when subjects review ideas with a constructive set (what are the good points of these ideas?), they come up with more creative solutions to the problem than does either a control group (with no instructions) or the group which has been instructed to use a critical set (what are the weak points?).

The more creative engineers engage in undisciplined, open-minded, and uncritical thinking in the initial stages of the problem-solving process.

Another significant finding of his experiments: those ideas that were reviewed constructively were often incorporated in the final solution. But ideas reviewed with a critical set were almost always rejected.

Another reason why critical weighing during the creative process should be avoided is that it robs the idea of the value and validity with which it is viewed when it first occurs. More ideas have been prematurely rejected by a stringent evaluative attitude than would be warranted by any inherent weakness or absurdity in them. The longer one can linger with the idea with judgment held in abeyance, the better the chances of capturing all its details and ramifications. Overelaboration is no problem, since there is always plenty of time later to prune the idea of the unnecessary details and redundancies that inevitably slip into the new product during the process.

During the heat of creative forming, the creative individual has to abandon himself entirely to his experience and be keenly aware of only the suggestions that emerge from the unconscious. Consciousness of the familiar sort has to be blotted out and he has to be implicated with his unconscious activity only. As in the procreative embrace self-consciousness and self-awareness detract from the intensity and fullness of the lovers' communion, so also in the creative process a lack of total abandon prevents the maintenance of open avenues to the unconscious source of ideas. (Apropos this I would like to mention that the creative urge is just as strong as the procreative urge, and sometimes creative activity takes precedence — if only because it lasts longer.)

Intrusion of self-consciousness, or a full and explicit awareness of what one is doing, robs the individual of the necessary ardor and excitement that should attend the process, with the consequence that the idea's development may become arrested. Deliberation that is self-conscious can be harmful even when the creative individual is occupied with the more conscious and rational development of his idea, when he is working on already secured insights. Even here a complete absorption in the business at hand is an absolute necessity. Of course, a total loss of consciousness of what is going on, or the unconsciousness of the act of creation occurs only during a trance-like absorption of the whole personality in the inspirational flow of ideas. The creative act in this case is so intense that the individual creates without knowing that he is creating. But this sort of oblivion to everything, except the suggestions arising from the unconscious matrix, is not the most common experience in creativity. An effortless, unforced spontaneity seldom spans the entire process.

In a sense, criticism and evaluation are at work already during the unconscious gestative or formative process of an idea. And they become more conscious with the progressive structuring of the idea. But as long as they do not hinder spontaneity or break the rapport with the unconscious, their function contributes to the implementation and development of the growing idea. It is often advisable that these cognitive functions remain submerged and secondary even when the polishing stage of the idea is reached and the pruning of redundant matter becomes the primary concern. For even while polishing, the creative individual has to maintain the grasp of the dominant idea and permit further insights connected with it to emerge into his awareness.

Critical Attitudes Kill Ideas in Others

That critical and evaluative attitude can stifle creativity in others has been noted by many researchers in the field. Dr. A. R. Wight points out that "a person will submit ideas with increasing reluctance if they are pounced upon immediately and subjected to critical and often merciless evaluation. It is difficult for a new idea to survive this kind of treatment. The effect on the individual suggesting the idea is equally devastating.

"Attacking this idea is felt to be, and often is, an attack on him personally. The individual feels hostility toward and often loses respect for the person initiating the attack. He soon refrains from suggesting anything at all. Or, he resorts to second-guessing, in an attempt to suggest something that will be accepted and approved."

"Henri's into creative computing."

Ideas that have been developed into completed forms are seldom conceived minutely and clearly right in the beginning of the creative process.

One way engineers can lessen the harmful effects of negative criticism is through learning to apply tact and diplomacy when they *have* to criticize. They should be open-minded and receptive toward ideas and suggestions offered them, and be good, understanding listeners. They should develop an ability to evaluate ideas without using external evaluation — that is, they should *react* to ideas rather than judge them.

The ability to be coolly objective about criticism comes only in time. It is based on a series of solid successes in creative problem solving. No matter how tough the engineer, over-critical attitudes, cynicism, ridicule, or even plain indifference on the part of others toward ideas he comes up with are tremendously destructive of idea-producing ability.

Fear of disappointment and anxiety about disapproval or censorship have prevented many engineers from coming up with original suggestions. What can be even worse, however, is that cumulative experiences of rebuff and criticism can result in a complete paralysis of idea-producing ability. No new ideas emerge, even in the privacy of the engineer's own mind.

Dr. Carl Rogers, one of our foremost psychologists, has advanced some suggestions on how we could establish a climate in which external evaluation is absent. Although utopian in terms of our present organizational set-ups, his notions are worth heeding. He explains it in this way: "When we cease to form judgments of the other individual from our own locus of evaluation, we are fostering creativity. For the individual to find himself in an

atmosphere where he is not being evaluated, not being measured by some external standard, is enormously freeing. Evaluation is always a threat. It creates a need for defensiveness. It means that some portion of experience must be denied to awareness.

"If this product is evaluated as good by external standards, then I must not admit my own dislike of it. If what I am doing is bad by external standards, then I must not be aware of the fact that it seems to be me, to be part of myself. But if judgments based on external standards are not being made, then I can be more open to my experience. I can recognize my own likings and dislikings, the nature of the materials and of my reaction to them, more sharply and more sensitively. I can begin to recognize the locus of evaluation within myself. Hence I am moving toward creativity."

The creative process is a slow, selective structuring of an idea that is only imperfectly intimated, and which follows the dictates of an intuitive feeling of what belongs and what does not belong.

It should be also pointed out that one of the chief values of *brainstorming* lies in its encouragement of a non-evaluative atmosphere. It is a technique for creating a climate in which the participants are free to express any idea — even a wild or far-fetched one — without fear of trigger-ready negative reactions. In experienced brainstorming groups, no-holds-barred thinking, deviant or divergent ideas are consciously encouraged, and there is a supportive atmosphere that encourages the elaboration of these ideas. The non-evaluative atmosphere also enhances the imaginative exploration of their implications, merits, feasibility of implementation and range of applications.

The Emotional Concomitants Of the Creative Process

Among the observable and introspectively reportable characteristics of the arrival of a new idea is the keen *sense of value* that adheres to it. The idea arrives brimming with positive feeling, which gives the creative thinker a poignant sense of certainty concerning its relevance to the problem he is tackling. At times this pleasant shock of surprise and the sense of profound well-being that the idea induces approach the feeling of rapture.

The positive feeling that infuses the idea undoubtedly lies at the root of many great achievements; still, it is not everything, for the painful process of shaping and forming it into a workable thing still lies ahead. Too often it is believed that the idea is, in and of itself, all there is to the creative process. Yet almost everyone has known idea-men who literally shook ideas from their sleeves, but who never amounted to much because they failed to work them out into something concrete and tangible.

Nevertheless, with most creative people, this emphatic sense of conviction as to the idea's vital import, the joy and exaltation it instills in them, are to a large degree responsible for starting the entire creative process moving. In addition, this positive feeling provides the creative individual with a reservoir of staying power to conquer every technical deficiency or temporary blockage that may occur. It also fills him with a sense of urgency to understand and penetrate to the minutest vestiges of his exalted new idea. That the creative individual feels overwhelming pride about his own ideas is further demonstrated by the fact that when the finished idea, product of device does not meet his approval, he invariably blames his incomplete technical skill or knowledge for his failure and sees no imperfection in his original concept.

It should also be pointed out that the subjective sense of certainty and conviction that the germinal idea induces is as hard and real as the perception of a concrete object. The individual is sure, at the moment the idea occurs to him, that he has seen or grasped the central core or essence of his crucial problem, or that he now has the insight for a vital new invention. At the time the idea occurs to him he needs no proof that such is the case, although doubt and uncertainty about the validity of the idea or new insight may occur later. Nevertheless, the click of recognition that an idea represents something significant is seldom betrayed by a true creative individual because of later doubts, or because of the overwhelming technical demands of the idea's translation into a tangible thing.

The intuitive moment is also frequently accompanied by a *sense of compulsion* that urges the creative individual to do something right away about the idea. The idea demands resolution through explicit overt action and often grows into a full-fledged compulsion if action on it is delayed or postponed. It recurrently invades his consciousness, no matter what he is doing or thinking, and charges his thoughts and perceptions, frequently against his own volition and judgment, in the direction of finding complementary elements or supporting data for the further development of the idea. It may even, at times, obstruct the emergence of other new ideas if it is not worked out.

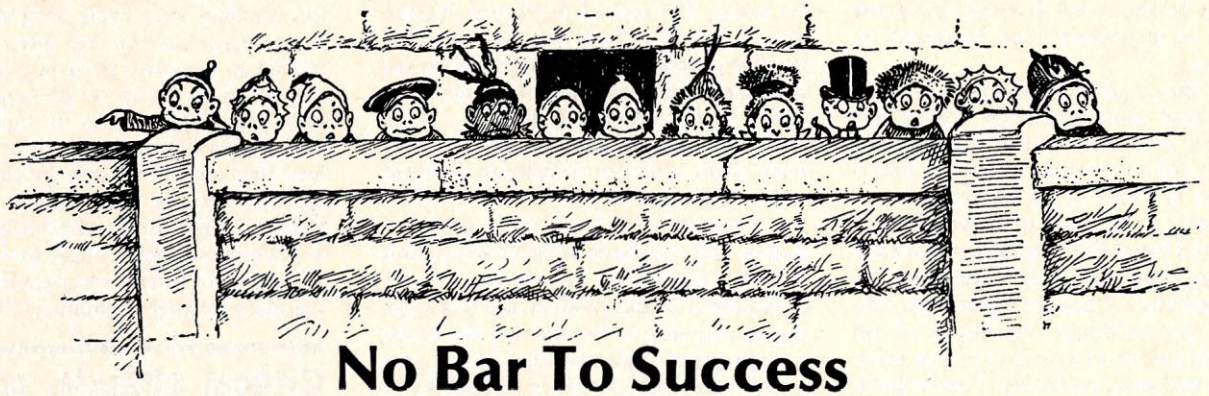
Many sterile days and possibly weeks may pass as the result of failure to heed the urgency of certain compelling ideas. They seem at times to have mobilized most of the available psychic energy the individual has, so that, even while he is engaged in some other activity, he often gets distracted in whatever he is doing and feels compelled to return to the original idea, even though the time or occasion for considering it is not propitious. The new idea thus sometimes has the earmarks of obsessiveness or compulsion about it. Indeed, if one observes the creative process at the highest level — at the genius level — this aspect of compulsive urgency is one of the most striking phenomena that occurs.

Critical attitude, according to several psychologists, seems to be the engineer's most notable personality trait, and it colors almost all of his perceptions.

Perhaps the genius should be described not so much in terms of talent or skill as by the intensity of the conceptions he formulates, by the overwhelming and overpowering urgency with which these conceptions surge up into his consciousness, compelling him to form and develop them into a tangible thing. Behind the genius there is always a vortex-like intensity, a forceful plan pushing his creative endeavors.

At the time the creative individual feels the compulsion to do something with his idea he may also be overwhelmed by a *sense of possession.* He may be possessed by his idea in the sense that he feels it comes from some external source rather than from within himself, and that his own consciousness is reduced to acting merely as a passive instrument. These ideas frequently amaze him after he has committed them to paper. After he is through working and can take stock of the entire result, he finds that there are many elements completely different from those he might have been consciously entertaining before starting to work. Often the finished product appears alien or incomprehensible to him, in the sense that he does not feel responsible for it. Try as he may, and irrespective of the pleasure and pride that it produces, he cannot view the finished product with the same ardor or feeling that had attended his experience during the act of creation. The felt value of the idea usually abandons the creative individual at the completion of his work. In case of longer creative problem solving activities, where interruptions become necessary, it is fascinating to note that the initial idea and the enveloping mood can be reinduced and suffer little or no change in the meantime. □

Dare a neophyte market his own programs?



No Bar To Success

Bill Pumphrey

I bought the last Apple in Paradise, or so I was told. At any rate, it was the last one in Honolulu's Computerland during last fall's hectic Christmas rush. The dream of owning my own computer had been fermenting in my brain for years. I had fantasies of unloading k's of data such as tax and investment records, address lists, checking and savings account records, charge accounts, daily appointments and such, from my over-burdened mind, freeing it for higher order social pursuits. With a new tax year starting and after a thorough evaluation of available computers, I felt the time was opportune to pick up my Apple. I hoped to learn how to operate and program it before the new tax year began.

Dying though I was to get the system up and running, a holiday party prevented me from unpacking it that night. By sunrise the next morning, I had my Apple out of the carton and connected, though a garbled test pattern of question marks and flashing semi-colons was as far as I could get without resorting to the Basic manual. As soon as I got past the section on loading programs, I was off and running with the Star Wars shooting game which entertained my 6 year old daughter, Alexis, and her friend, Tony, for an hour. After they tired of shooting, I attempted to load the High Resolution Graphics program but the complex double load (and a typo in the manual) only got me an hour of frustrating "err's." I managed to load Star Trek but, without instructions, found the game useless.

By noon, the free programs had lost their challenge and I had settled down to learning programming via Apple's well-written Basic Manual. This endeavor was also short-lived, however, when I discovered that my Apple had a worm, or some kind of a bug, in it. After half an hour of operation, any key depressed would result in a series of letters as if the repeat key was being held down. A frantic call to Computerland advised me that it could be a defective chip overheating. Sure enough, a fan blowing on the memory board stopped the problem. My wife had been skeptical enough about my $1200 purchase without her having to see a fan blowing on my fantastic new toy, so I rushed the Apple back to the store, where it was eventually discovered to have a defective keyboard. Luckily, Computerland had a spare one to lend me while mine went back to California for repair.

In the following weeks, I discovered that I must have a binary mind; I took to programming like a bee to honey. By January I had modified an income tax program to meet my requirements for numerous supplemental forms and I was making good use of Apple's checkbook program. Some of my dream applications were becoming realities even though several had realistically been dropped. The Apple people had provided many games and other programs free for the taping, so my software collection was growing.

Worst, while I recalled the colorful Apple ads in Playboy which showed a television screen crowded with colorful graph bars, yet I failed to locate a program which would create such graphs.

Color graphics was one of the reasons I had chosen Apple. Some games utilized this capability, but most business applications had no need for it. Worst, while I recalled the colorful Apple ads in *Playboy* which showed a television screen crowded with colorful graph bars, yet I failed to locate a program which would create such graphs.

One afternoon while sitting floor duty at Luke & Luke Realty, where I work, I decided to write a program which would plot color bar graphs. The basic program which I developed that afternoon did indeed plot a color vertical bar on the screen. Next, I had to develop equations to space the bars equally, draw the graph grid and frame, code the bars (months, letters or numbers), center the title in the text area, and compensate for any unusual rounding-off errors by Applesoft. Because my background is marketing, I wrote easy-to-understand input statements and added error messages to guide neophytes such as I.

My first rough graph program and the final edition, which I copyrighted, are vastly different. As I constantly improved the program, I discovered subroutines which saved both memory and time. In February I decided to market my programs by direct mail. *Creative Computing* seemed the most logical place to advertise. Unfortunately, nearly two months lead time was required from receipt of my ad to the issue in which it would be published.

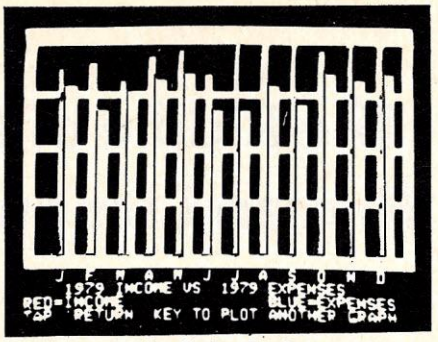
Ad costs for software publishers were extremely reasonable, considering the magazine's circulation. I prepared a projection of my order requirements to pay for different size ads and settled on a 3 inch, one column classified ad captioned "New Apple Software." I always went through each issue with a red pen, circling all Apple software ads and I hoped other Apple owners did the same. I wrote the ad copy myself and, after numerous revisions, had it typeset in Honolulu ($12.50) to avoid the possibility of a typographical error and the time delay required for approval of ad proofs.

By the time I decided to market my

Bill M. Pumphrey, 469 Ena Road #1310, Honolulu, HI 96815.

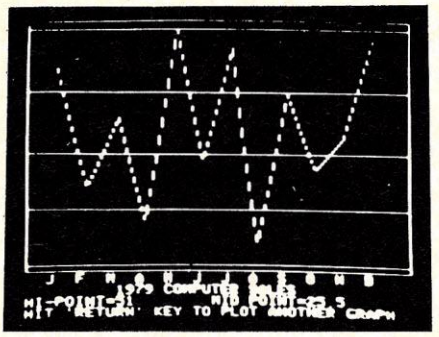
graph program, I had developed it into four different programs (Basic Color Bar Graph, Double Bar Graph, High Resolution Line Graph and a Deluxe Color Bar Graph which required greater RAM than the basic due to additional features). I had located a source of 5 minute cassette tapes which cost about 65¢ each when purchased in bulk lots. I had rubber stamps made to label the tapes and I wrote and printed a page of instructions for each program. Sundry other items were needed to get me into business: receipt book, ledger, heavy duty mail envelopes, fragile and first class mail labels, address labels, etc.). Unless I became snowed under in orders, I planned to record each tape on my Panasonic recorder. I cleaned the recording head frequently and tested each tape for loading. Because I had had some programs on beginnings of tape which loaded poorly, I recorded each program twice for my customers.

In late March, my first order arrived. Throughout the next three months, orders and inquiries came in from across America with a few from Europe, Canada and South America. Nearly every order was for all four programs. Some technical inquiries involving adapting the programs for other computers, but program modifications were beyond my knowledge. Only one order came back (the tape had been damaged in the mail), and several customers wrote that they were very pleased with the program.



Double Bar Graph

Creative Computing has a reader's inquiry card in each issue and more than 300 readers wrote requesting additional information. I designed a self-mailer flyer which I sent to the first 180 respondents. Printing and postage charges ran about 22¢ per flyer; I insisted on first class mail so inquiries would be handled quickly. Free addressed gummed labels had been provided for each inquiry. Monitoring the results of these flyers, I determined that the resulting sales did not justify the cost of sending flyers. To double-check this finding, I sent out a second mailing a month later. It too drew minimal response. As something of an advertising expert, I will concede that the flyer could have been a factor in the low response. Nonetheless, I did not mail any more flyers to inquirers.



Hi Res Line Graph

To date, my profit (not reflecting in my costs the time spent developing the programs and processing orders) is negligible. Personally, however, I do not consider it a loss. My experience gave me a greater understanding of my Apple, provided me a personal case history of direct mail to use in the advertising course which I teach at Hawaii Pacific College and introduced me to fellow Apple owners across the country. I would urge any small-computer owner to develop new programs for his equipment; the challenge is certainly more fulfilling than simply running programs written by others. But, if it is marketing your program that interests you, I would advise you to let some established software publisher handle it. Your time can be better spent developing yet other programs. □

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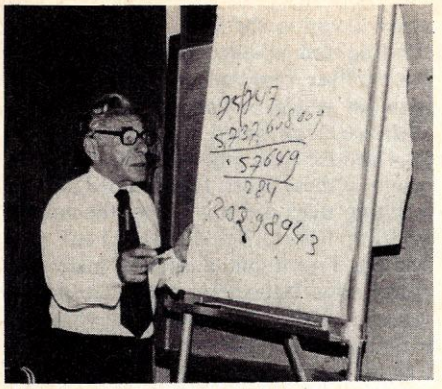


Wim Klein, a well-know "human computer" performed amazing fests involving complex calculations at the Brown sympsium in September 1979.

The Riddle of the Human Computers

Paul Brock

A question which has perplexed scientific men for several centuries is the strange ability of a few phenomenally-gifted human beings to perform mental feats of calculation which are utterly beyond the powers of the average man. Even a trained mathematician could perform these tricks — if he could do them at all — only with the help of computers and a generous allowance of time.

Generally, this power shows itesIf in early youth. It sometimes disappears as the child grows up, but more often it persists and develops throughout life. Usually it perishes with its possessor — though in one or two cases it has passed on from one generation to another.

But the most significant thing is that it is extremely rare. In all, there are not more than 30 genuine and authenticated cases of this kind.

The first case of which any truly authentic record exists is that of Jedediah Buxton, a farm laborer in Derbyshire, England, and this only dates from the middle of the 18th century.

Buxton, whose amazing powers were tested and applauded in 1754 by the world's foremost scientific body at that time — the Royal Society — was a dull-witted yokel who never learned to read, write or use written figures. Nor did he even learn the use of ordinary terms such as "thousand," "million," "billion," and so on. When dealing mentally with high numbers — and some of them were colossal — he gave them names of his own such as a "tribe," a "covey," or a "cramp."

Numbers fascinated him. He seems to have spent much of his life, while laboring in the fields, in abstruse mental calculations. And while his results took a long time to arrive at because he was a slow thinker, they were always right.

In 1750 he was asked to work out, to the nearest pound, what sum a farthing would come to if doubled 140 times. Several days later he gave the correct answer, which contains 39 figures.

Paul Brock, 15 Anderson Cove Rd., R.R. 1, Sooke, B.C., Canada. V0S 1N0.

He was then asked if he could multiply this huge number *by itself,* mentally, and he said he thought he could. He kept his word two and a half months later, and explained that he had carried out the calculation "just now and then" whenever he felt like it! His answer was 100 percent correct.

A much more typical specimen of the "calculating boy" was Zerah Colburn, of Vermont, U.S., who was touring the country as a "lightning calculator" at the age of six. When aged eight, he was quite unable to give any explanation of how he worked. Once, in reply to a persistent enquirer, he burst out with "God put it into my head and I can put it into yours!"

He could answer all the stock questions about the number of seconds in so many centuries, the number of grains in so many bushels of corn, and so on. Also he could *instantly* multiply together any two numbers of four figures each, and — which was much more remarkable and has puzzled mathematicians ever since — he could "factorize" at sight any number up to a million.

A typical specimen of the "calculating boy" was Zerah Colburn, of Vermont, U.S., who toured the country as a "lightning calculator" at the age of six.

For instance, on being asked for the factors of 171,395 he at once said that it was the product of 5,7,59, and 83. For those of 247,483, similarly, he gave 941 and 263, while on being asked for the factors of 36,083 he said, "There aren't any." That number is what mathematicians call a "prime" and has no factors at all, except 1.

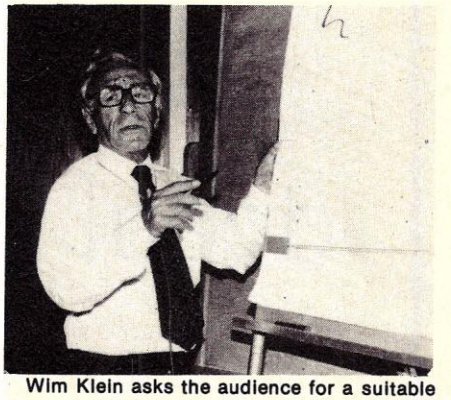
Now if the average mathematician, given pencil and paper, were asked to find the factors, if any, of 247,483 it would take him a very long time. He would know that one such factor, if the number were not a prime, must be less than 497 (the approximate square root of 247,483) and he could rule out even numbers and those ending in 5, and so on. But he might have to try, say, 100 divisors before he hit on 263 — a number which Colburn gave immediately and almost absent-mindedly.

It is practically inconceivable that the boy could have memorized the factors of all numbers up to one million — although the thing has been done on a much smaller scale. For example, a later calculator, Carl Ruckle, certainly knew by heart the factors of all the numbers from 1 to 1000 — and it used to be said of the mathematician Strinavasa Ramanujan that he was as well acquainted with the first 2,000 numbers as if he had been their intimate companion since boyhood.

On one occasion when the Indian wizard at figures was sick in London, a friend called to see him. Knowing that the Indian took little or no interest in anything except numbers, he began by remarking, "The number of the taxi which brought me here was 1729, but I suppose there's nothing particularly interesting about that."

"There certainly is," was the eager reply. "That's a *most* interesting number. It's the smallest which can be expressed as the sum of two cubes in more than one way!" (1729 equals 12 cubed plus 1 cubed, and also 10 cubed plus 9 cubed.)

Zerah Colburn lost his powers as he grew up, and his later career was not very successful. He wrote an autobiography in which he gave a hint as to his method of



Wim Klein asks the audience for a suitable large (9-digit) seed number to multiply by itself.

factorizing, in the shape of a table from which, knowing the last two figures of a given number you could find the last two figures of its factors, if any. He seems to have used this method by intuition, long before he was sufficiently educated to put it down on paper.

Living about the same time as Colburn — whom he once met and defeated in a public contest — was G. P. Bidder, afterwards a well-known civil engineer. The son of a stone mason, he began to show extraordinary powers of mental calculation when about seven years old, although at that time he had only been taught how to count up to ten and could neither read nor write.

Two specimen questions put to young Bidder when he was on tour at the age of 10 or 11 are: If a wheel is 5ft.10in. in circumference, how many turns will it make in a distance of 800,000,000 miles? The answer is 724,114,285,714 and the boy gave it in 50 seconds; and what is the square root of 119,550,669,121? Answer, 345,761, given in 30 seconds.

At this age, too, Bidder could rapidly work out, mentally, the most complicated questions relating to annuities and compound interest.

He retained and developed his amazing powers during his long life, and while working as a railway engineer often found them invaluable. He used to be spoken of as "the best witness who ever entered a committee room," and he thought nothing of working out off-hand, and on data just supplied by his opponent, the exact cubic content, and cost of digging, of a railway cutting varying in slope and from one to five miles long!

J.M.Z.Dase, a German, was a calculator of the Buxton type — remarkable not so much for the speed of his work but for the enormous size of the numbers he could handle mentally. On one occasion, when being tested by the Berlin Academy of Sciences, he was asked whether there was any limit to what he could tackle in this direction, and he said he knew of none and would welcome a severe test.

So he was given two prime numbers each of *one hundred* figures, and invited to multiply them together. He did this mentally, correctly, and while under continuous observation, the problem taking him *eight hours*. On another occasion he extracted the square root of a 100-figure number, mentally, in 52 minutes!

He also had the remarkable gift of being able to count a large number of similar objects (sheep in a flock or the letters on a page of a book) at a glance.

Yet he was no mathematician. He could never manage to understand the simplest rule in geometry or algebra, and his work was purely arithmetical and elementary.

One of the best known modern calculators who gave public performances was Jacques Inaudi, an Italian. His calculating powers showed themselves at the early age of six.

One feat of his was to stand with his back to a gigantic blackboard on which assistants worked out the sums dictated by the audience and with which Inaudi was dealing mentally. He concluded his performance by repeating in a prearranged order, and without turning around, every figure on the board including those used in the calculations — and by that time the board was absolutely crowded with them.

Among other feats, he could always give, generally in a second or less, the day of the week corresponding to any specified date. One mathematician gave him "September 9, 1752, but he knew the answer at once and shouted "No day." It was one of the 11 omitted when the Gregorian Calendar was adopted.

Like both Colburn and Dase, Inaudi had one special feat peculiar, or almost so, to himself — this being the expression of any number less than 100,000 as the sum of four squares. Any mathematician knows that *any* number can be so expressed, but the problem of finding the components is generally a difficult and laborious business. Yet Inaudi could always do it, mentally and in less than a minute.

Bidder could grasp a number better after hearing it once read out than after reading it on paper a dozen times.

We are still very much in the dark about how these extraordinary mental feats are performed. The ones who perform them have no clues either. But clearly, one of the first essentials is a profound and phenomenal memory.

It seems fairly certain, too, that most mental calculators, in addition to having exceptional memories *for figures* (they generally find difficulty in memorizing a long string of *letters)* have a great gift of mental imagery, or what is called the "mind's eye." They work out their calculations on a sort of mental blackboard.

In fact, Bidder's son, J.P. Bidder, who became a brilliant lawyer, and who inherited much of his father's ability, said he couldn't imagine any other way of doing mental arithmetic. Yet Bidder himself made no use at all of this plan, but worked entirely by sound. He could grasp a number better after hearing it once read out than after reading it on paper a dozen times.

But the fact still remains that the great majority of well-attested feats of mental calculation are completely baffling, even in the present state of advanced scientific knowledge. □

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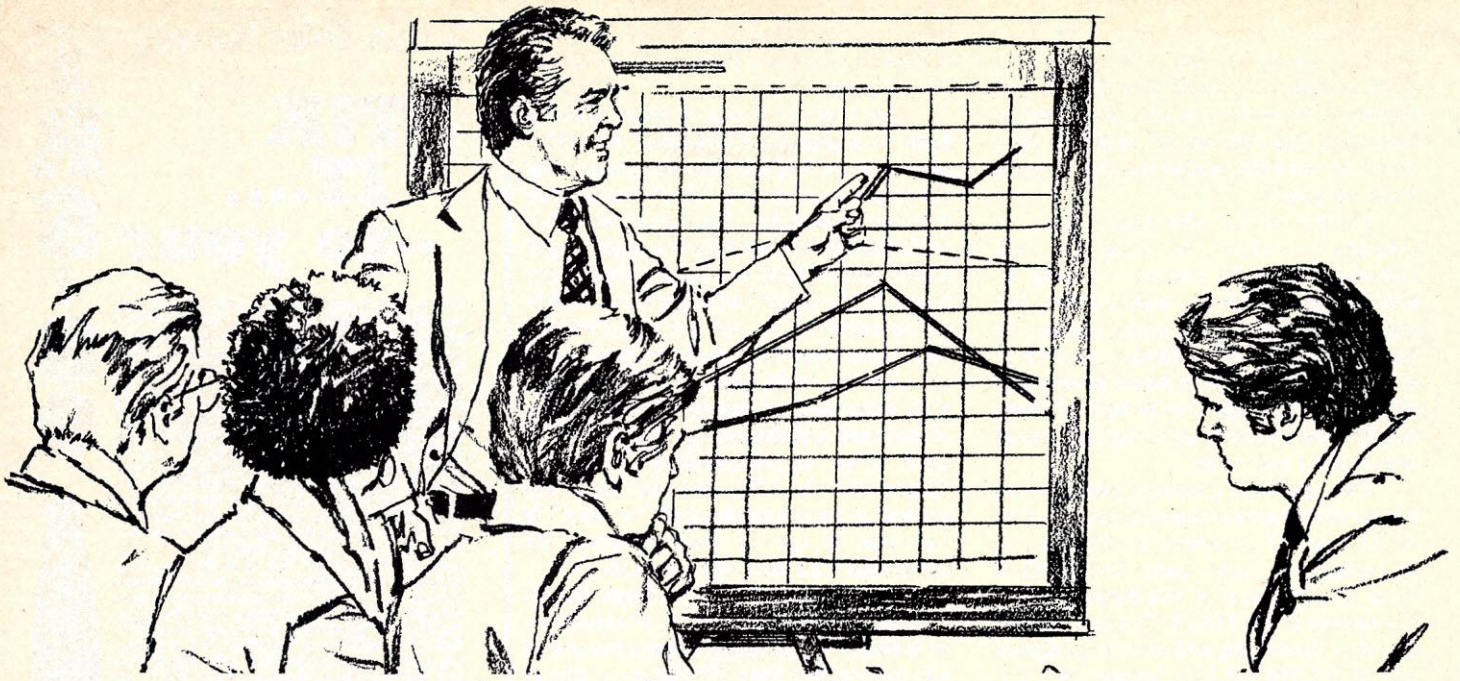


Stocks and Listed Options

Part 4-The Price of an Option and Program NEWPREM.

Alfred A. Adler, Ph. D.

Review

In the first article of this series the stock market was presented as a place where buyer and seller, or their representatives, meet and engage in an auction. Brokers were discussed as the usual form of representative, and the necessity for including the ever present commissions in all calculations was discussed at some length. Some of the possible varieties of investment attitudes were touched on briefly. This was followed by a discussion of puts and calls, the listed option markets, and one or two of the more obvious option strategies.

The second article continued the discussion of option strategies with a brief presentation of the six basic maneuvers. Program OPGRAPH was then presented and discussed, followed by sample runs illustrating combination strategies, with covered and uncovered calls, and covered and uncovered straddles receiving fairly detailed treatment.

Part 3 continued with more details on call writing followed by a fairly detailed discussion of opening versus closing option transactions. Program OPTION was presented along with sample runs covering hedging with calls, out-of-the-money hedges, and in-the-money hedges.

From this point on it will be assumed that the reader has read the previous articles in the series, and can refer to them as necessary.

The price of an option, the premium, is composed of two parts: the intrinsic value, and the time value.

The Future Of The Position

In Part 2 of this series covered and uncovered calls, and covered and uncovered straddles, were discussed. In Part 3 hedging with calls was discussed in considerable detail. The emphasis in all of these discussions was on establishing the position. The future maintenance or disposition of the position was given little thought.

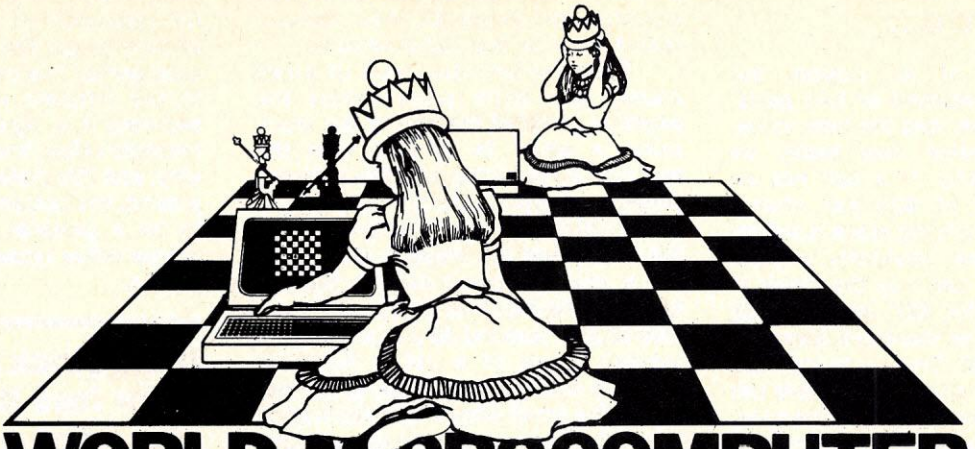
Obviously, establishing a position is only the beginning of the game. As stock prices and option prices fluctuate, the position must constantly be reevaluated to determine whether or not it should be maintained, modified, or terminated, and, if either of the last two, in what way. As an aid to answering the questions which inevitably arise, a means of predicting the way in which the future option premium is likely to track the stock price and the passage of time would be of great help.

It is the purpose of this article to address the problem of predicting the future course of option premiums and presenting a program designed to project option premiums from a user chosen data base into the future.

Intrinsic Value And Time Value Of An Option

It is well known that option premiums move up and down with stock price and decrease nonlinearly as expiration approaches. It is equally well known that option premiums are highly volatile and can change drastically as investor confidence waxes and wanes, even in the absence of significant changes in stock price or time. For this reason it is virtually impossible to accurately predict future option premiums. It is possible, however, to predict, based on a stable reference period, what an option premium should be, assuming continuity of investor attitudes. This future premium is of course dependent on the assumed future time and stock price at that time.

Alfred A. Adler Ph.D., 10360 E. Flintlock Trail, Tucson, AZ 85715.



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Cunard International Hotel,
London, 4 — 6 September.

Stocks, cont'd...

The price of an option, the premium, is composed of two parts: the intrinsic value, and the time value. The intrinsic value may easily be determined exactly. If a call has an exercise price of $25 per share, whereas the underlying stock is selling at $27 per share, obviously anyone owning the call can buy the stock at $25 and sell it for $27, making a $2 profit. The call is therefore certainly worth at least $2. That is its intrinsic value. Note that commissions are not considered since certain people, notably stock exchange members, can trade without paying commissions. Since these people can move into the market and make a profit anytime the price of the call in the previous example falls below $2, their demand puts a floor on the call premium.

Thus the intrinsic value of a call equals the stock price minus the exercise price of the call. If the stock price is equal to or less than the exercise price of the call, the intrinsic value is, of course, zero.

If a put has an exercise price of $25 per share and the stock is selling for $23 a share, anyone owning the put can buy the stock at $23 and force a sale at $25, making $2 per share. The intrinsic value of a put is therefore equal to the exercise price of the put minus the stock price. If the stock price is equal to or greater than the exercise price, the intrinsic value of the put is zero.

The time value of an option is the value investors place on its potential for appreciation. It is essentially the price of hope, the ante to get into the crap game. The time value, in contrast to the intrinsic value, is totally unsecured. It is, again in contrast to the intrinsic value, a wasting asset. This is why, and this statement will blow many a mind, the option buyer is more likely to be a gambler, whereas the more conservative types lean toward option selling.

If the stock price is equal to or less than the exercise price of the call, the intrinsic value is zero.

The time value of an option is not easy to assess. It is a strong function of the volatility of the stock, a weaker function of the trading volume, and depends on the spread between the stock price and the exercise price. This latter point will be discussed later. Above all, the time value depends on investor expectations. Obviously, if the

Figure 1

```
<<<<<  Program  NEWPREM  -  by  Alfred  A. Adler  Ph.D.  >>>>

Do you want to see the normalized premiums? : YES

####################  INTRODUCTORY  DATA  ####################

Stock Symbol, Remarks : NWA
Do you want predictions of puts or calls? CALLS
Can you state the time function constants? NO

How many days will you use for your data base? 2
And how many exercise prices per day? 2
Choose exercise price No. 1 : 25
Choose exercise price No. 2 : 30

#############  THE DATA BASE WILL NOW BE INPUT  #############

FOR DAY 1 OF DATA BASE,
-----------------------
Give day no. : 255; and stock price : 29
List the 3 expiration day nos. (in chronological order) for
   options available on this day : 321,48,139
Give the 3 premiums corresponding to these expiration day nos.
   for an exercise price of 25 : 4.375,5.125,7.125
Give the 3 premiums corresponding to these expiration day nos.
   for an exercise price of 30 : 1.75,2.8125,3.875

            TABLE OF NORMALIZED OPTION PREMIUMS

EXERCISE              DAYS TO EXPIRATION
 PRICE        66              158             249
 25       1.2808689       2.4011716       4.7186465
 30       2.1937411       3.2745467       4.3463346

FOR DAY 2 OF DATA BASE,
-----------------------
Give day no. : 248; and stock price : 25.5
List the 3 expiration day nos. (in chronological order) for
   options available on this day : 321,48,139
Give the 3 premiums corresponding to these expiration day nos.
   for an exercise price of 25 : 2.25,2.9375,3.625
Give the 3 premiums corresponding to these expiration day nos.
   for an exercise price of 30 : .6875,1.1875,1.875

            TABLE OF NORMALIZED OPTION PREMIUMS

EXERCISE              DAYS TO EXPIRATION
 PRICE        73              165             256
 25       1.9843135       2.6758468       3.365728
 30       1.8884932       2.5988278       3.4573291

##############  THE DATA BASE IS NOW COMPLETE  ##############

THE TIME FUNCTION CONSTANTS ARE :
A =  51.893012
B =  1.6790825

DAYS TO EXPIRATION          ADJUSTED NORMALIZED PREMIUMS

      5                          9.6053648E-02
      10                         .19151739
      15                         .28640225
      20                         .38071834
      25                         .47447609
      50                         .93522057
      100                        1.8198781
      150                        2.6613823
      200                        3.465492
      250                        4.2367903
      300                        4.9789927
      350                        5.695163

#####  ENTER PARAMETERS FOR PREDICTED OPTION PREMIUMS  ######

***  Do you want a table of premiums for 9 options on a  ***
     chosen day for a chosen stock price, or do you want
     a graph of the premium for 1 option on a chosen day
     over a range of stock prices : T or G? T

Choose the 3 exercise prices desired : 25,30,35
Choose the 3 expiration months :
   (3 letters each, without commas) : FEBMAYAUG
List the 3 expiration day nos. corresponding to these
   expiration months : 48,139,230

For prediction day : Give day no. : 21
   and assumed stock price on that day : 31.5

################  PREDICTED OPTION PREMIUMS  ################

EXPIRATION MONTH      |     FEB      MAY      AUG    |
DAYS TO EXPIRATION    |      27      118      209    |
----------------------|-----------------------------|
EXERCISE PRICE   25   |    6.54     7.13     8.10    |
                 30   |    1.66     3.01     4.43    |
                 35   |     .07     1.00     2.26    |
----------------------|-----------------------------|

For prediction day : Give day no. : 21
   and assumed stock price on that day : 28.5

################  PREDICTED OPTION PREMIUMS  ################

EXPIRATION MONTH      |     FEB      MAY      AUG    |
DAYS TO EXPIRATION    |      27      118      209    |
----------------------|-----------------------------|
EXERCISE PRICE   25   |    3.57     4.50     5.76    |
                 30   |     .16     1.51     2.93    |
                 35   |     .04      .63     1.60    |
----------------------|-----------------------------|

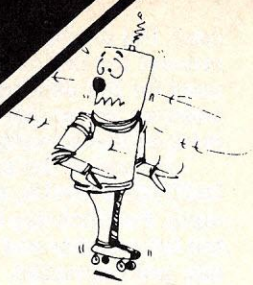
For prediction day : Give day no. : 41
   and assumed stock price on that day : 31.5

################  PREDICTED OPTION PREMIUMS  ################

EXPIRATION MONTH      |     FEB      MAY      AUG    |
DAYS TO EXPIRATION    |       7       98      189    |
----------------------|-----------------------------|
EXERCISE PRICE   25   |    6.50     6.96     7.88    |
                 30   |    1.51     2.69     4.13    |
                 35   |     .01      .75     1.98    |
----------------------|-----------------------------|

For prediction day : Give day no. :
STOP IN LINE 1020
READY
RUN
```

TRS-80 LEVEL II



Pursuit Games, CS-3004 (16K)

• Stock Car Race $7.95

Stock Car Race is a real time racing game on a road race circuit. Your high speed racer is controlled by the "arrow" keys, as you shift up and down through four gears. Take the turns slowly, "floor it" on the straights, but don't blow your engine!

• Maze

Maze for the Level II 16K machine is a high speed pursuit game. You are timed throughout your run and rated on the basis of elapsed time and the number of moves required to escape. A different maze every time. Nine skill levels.

• Indy Racer

Indy Racer is a real time racing game for the TRS-80. You're in the driver's seat of a red-hot Indy car, changing gears and weaving around the track as you pass your competitors. Indy Racer is similar to the popular arcade-style driving games.

• Depth Charge

As commander of a destroyer, your mission is to destroy as many enemy subs as possible. Move your ship back and forth on the water, positioning yourself over enemy subs as they cruise into range. Depth charges sink slowly, so timing and position are important in this re-creation of the Battle of the Atlantic.

• Kaleidoscope

This graphics demonstration program turns your TRS-80 into a computer age kaleidoscope. You enter the number of lines and size of the display to produce changing patterns on the video monitor. Truly hypnotizing, Kaleidoscope runs continuously to brighten up your home or office.

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Space Games-3, CS-3002 (16K)

• Ultra-Trek $7.95

Ultra-Trek is a fast-paced version of Star Trek, complete with "real time" action graphics, lasers, Nilon space mines, high energy photon torpedoes, enemy ships that move, and an experimental ray which does something different each time you use it. You must act quickly to save yourself and the Federation.

• Star Lanes

Imagine yourself the president of an intergalactic shipping company. If you're successful, you may be named Imperial Advisor on Economic Affairs. Entrepreneurs: to your ships.

• Star Wars

If you hate Darth Vader, you'll love Star Wars. This real time game is fun for aliens of all ages. May the Force be with you!

• Romulan

Your mission is to destroy an invading Romulan space craft. Maneuver through space and around stars looking for the deadly enemy, but be careful! The nasty Romulans fire back.

How To Order

Send order and payment to **Creative Computing**, P.O. Box 789-M, Morristown, NJ 07960. Add $1.00 shipping and handling per order (foreign, $2.50) N.J. residents add 5% sales tax. Visa, MasterCharge and American Express orders welcome. For faster service, call in your bank card order toll free to: **800-631-8112.**(In NJ, call (201) 540-0445.)

sensational software

Strategy Games, CS-3005 (16K)

• Tunnel Vision $7.95

You are transported into a massive labyrinth and must find the exit or be lost forever. This is an excellent example of three dimensional perspective using TRS-80 graphics.

• Evasion

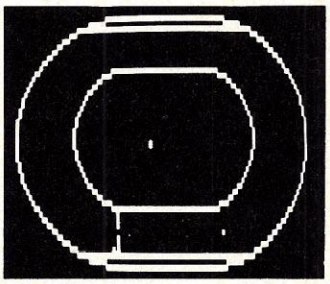
In this real time game, you are pursued around the game board by an evil-looking snake. Variations of play include two different speeds and hyper-jumps which randomly relocate you on the board. Looking for an escape? Try Evasion.

• Jigsaw

Jigsaw is a computer-age puzzle game making extensive use of TRS-80 graphics. The computer generates a random puzzle and puzzle board. Using a combination of deductive reasoning and luck you must fit the graphically represented puzzle piece into place.

• The Masters

Are you a wandering pro or just a Sunday golfer who would like to keep in practice? Once you're on the green, a worm's-eye view is displayed for putting.



• Motor Racing

Motor Racing combines real time racing action with advanced graphics functions. The graphics and animation make Motor Racing fun to watch as well as play.

Adventure

Welcome to an astonishing new experience! **ADVENTURE** is one of the most challenging and innovative games available for your TRS-80.

• Adventureland

You wander through an enchanted world trying to recover the 13 lost treasures and encounter WILD ANIMALS, MAGICAL BEINGS, and many other perils and puzzles.

CS-3008 TRS-80 16K Level II $14.95
CS-3506 TRS-80 48K DISK $24.95
(Includes Pirate Adventure)

• Pirate Adventure

Can you recover LONG JOHN SILVER's lost treasure.

CS-3007 TRS-80 16K Level II $14.95
CS-3506 TRS-80 32K DISK $24.95
(Includes Adventureland)

• Mission Impossible Adventure

Will you be able to complete your mission in time? Or is the world's first automated nuclear reactor doomed?

CS-3009 TRS-80 16K Level II $14.95
CS-3507 TRS-80 32K DISK $24.95
(Includes Voodoo Adventure)

• Voodoo Castle

Count Cristo has had a fiendish curse put on him by his enemies. Will you be able to rescue him or is he forever doomed?

CS-3010 TRS-80 Level II $14.95

CS-3507 TRS-80 32K DISK $24.95
(Includes Mission Impossible)

• The Count

You'll love this Adventure; in fact, you might say it's LOVE AT FIRST BITE . . .

CS-3011 TRS-80 Level II $14.95

Stocks, cont'd...

market is expected to rise, the time values on calls will be high and those on puts will be low. On the other hand, if gloom and doom prevail, time values on calls will be low, while those on puts will be high.

The option premium is the sum of the intrinsic value plus the time value, no more, no less, always.

Algorithms For Variation Of Option Premium

As time passes, the time value of an option decreases, slowly at first, and then with increasing rapidity. Finally, on expiration day, the time value has decreased to zero. The option either expires worthless or at its intrinsic value, depending on the relationship between the stock price and the exercise price, as discussed earlier. Clearly the time value is a monotonically (which means moving always in the same direction) decreasing function of time. This means that the shorter the time to expiration, the less the time value. Further, as the time to expiration decreases, the rate at which the time value decreases becomes greater and greater. Theoretically, there should be no deviation from these rules.

As it turns out, the time value also depends on the relationship between the stock price and the exercise price. The time value tends to be greatest when the two are very close and drops off to near zero when the discrepancy is very large. The reason for this is obvious. When the price discrepancy is very large, either there is no game, or there is little incentive to play. In the case of calls, if the exercise price is far above the stock price, there is little hope, and if the exercise price is far below the stock price, the option premium is so high (the intrinsic value is high) that few are interested in playing. In the case of puts, these statements reverse.

The variation of option premium versus time and versus stock price was examined over an extended period of time for a large number of stocks. Very definite patterns were obvious, in close conformance to the above theoretical principles. From this effort it was possible to define the general form of the analytical function which the data were following. Having this, it is only necessary to determine the constants of the equation. These, of course, will be different not only for each stock but for each class of option (put or call) based on that stock. This is because option premiums are affected, on a very stable basis, by the volatility of the stock, the average trading volume, etc. These factors cause differences from one stock to another and require that the constants be determined independently for each stock. World and national politics, the ebb and flow of the world of finance, the business cycle, etc. all affect investor sentiment and this causes the constants for a given option class, and based on a given stock, to change from time to time. When major changes in investor outlook become apparent, the old constants become invalid and new constants must be established from more recent option premium data.

Specifically, a function has been found that represents the variation of option premium with stock price at an arbitrary fixed time. Another function has been found that represents the variation of option premium with time for an arbitrary fixed stock price. Given option premium data over some chosen reference period, the constants for any option may be determined and the algorithms used jointly to project the future option premium at any time corresponding to any stock price.

The secret of laying a good data base is to select data that is 'typical' as opposed to 'far out.'

Program NEWPREM

Program NEWPREM is designed to accept historical option premium data, determine the function constants, report them for future use, and present the desired predictions of future option premiums in either tabular or graphical form, as the user chooses. No personalization is required.

Instructions for use are not included in NEWPREM, as they are in all the other programs, as both the program and the instructions are lengthy. Since it is desirable that the program be usable with either a North Star Horizon with 32K of RAM or a TRS-80 16K Level II, the instructions are available in Program INSTRUCT, furnished with NEWPREM.

Following the run command, the program will ask whether or not the user desires to see the normalized premiums. The answer to this question will be discussed later. The program will prompt the user to furnish the INTRODUCTORY DATA: the stock symbol and remarks, whether predictions of puts or calls are desired, and whether or not the time function constants can be stated. Obviously, on the first run they cannot be. In that case, the prompts will continue with a request for the number of days to be used for the data base, the number of exercise prices per day, and a statement of these exercise prices.

Following the entry of the INTRODUCTORY DATA, the DATA BASE is input. For each day of the DATA BASE, the day number and stock price on that day are requested. The 'day number' refers to the number of days since the beginning of the year. This was discussed in the third article of the series in conjunction with Program OPTION and a table of day numbers was presented in Figure 1 of that article. The prompts continue with a request for the three expiration day numbers for options available on this day, and the option premiums corresponding to those expiration day numbers for each exercise price in the DATA BASE.

When the data for DAY 1 has been entered, the program reports back with a TABLE OF NORMALIZED PREMIUMS. This table gives values of option premiums in three columns. Each column corresponds to a different number of DAYS TO EXPIRATION, and each row corresponds to a different EXERCISE PRICE. The values of all these premiums have been normalized for the exercise price, which means that the theoretical effect of exercise price has been removed from the premiums. Therefore, all of the values in any column should be the same. Any differences in the premiums in a given column are due to inconsistencies in the real world premiums. Over or under priced options may be spotted in this manner, where under or over priced means with respect to the other options in the group, not in an absolute sense. The numbers will of course vary greatly from column to column because the effect of DAYS TO EXPIRATION has not been normalized out.

Following each DAY of the DATA BASE, such a TABLE OF NORMALIZED PREMIUMS is presented. Each table uses only the data from that day. When the DATA BASE for all of the DAYS has been entered, the TIME FUNCTION CONSTANTS are presented followed by a table of ADJUSTED NORMALIZED PREMIUMS. The adjustment in this case means that a curve, of the correct theoretical form, has been fitted to all of the normalized premiums in the DATA BASE in such a way as to determine the value best representing the combined data as a function of DAYS TO EXPIRATION. The table therefore represents the premium, normalized with respect to exercise price, versus DAYS TO EXPIRATION. The effects of the differences in DAYS and STOCK PRICE have obviously also been removed.

The inclusion of these normalized premiums is to allow the user to check on the consistency of his input data, which is, after all, the basis of his data base. Printing or not printing these values does not affect the run in any way. It is suggested that the NORMALIZED PREMIUMS be looked at when loading a DATA BASE but not when the TIME FUNCTION CONSTANTS can be furnished. Obviously, once a DATA BASE has been loaded and the TIME FUNCTION CONSTANTS obtained, no more data need be loaded for that particular option class (put or call) for that particular stock as long as no major change in the market situation or investor attitude occurs.

The option premium is the sum of the intrinsic value plus the time value, no more, no less, always.

When the DATA BASE has been entered and the TIME FUNCTION CONSTANTS determined, the program will ask whether tabular or graphical predictions are desired. If premiums are desired in tabular form, the user will be asked to choose three exercise prices and three expiration day numbers. He will then have to furnish the day number for prediction day and the assumed stock price on that day. Nine PREDICTED OPTION PREMIUMS will then be furnished in a form similar to the way option premium data is presented in the Wall St. Journal and other newspapers; that is, in matrix form with expiration months across and exercise prices down.

If predicted premiums are desired in graphical form, the user will be asked to choose one exercise price and one expiration month, that is, a single option. The day number for prediction day will then be requested along with the price range of the underlying stock over which premiums are to be predicted. The program automatically computes the premium scale for the graph, making sure it is an easily read scale such as one, two, five, or ten to the unit, and plots the graph vertically, premium versus stock price for a single option.

Whether a table or a graph is presented, the program recycles back to the request for the prediction day, thereby preserving the effort that has already been expended in loading data.

Sample Runs

In order to demonstrate the operation of Program NEWPREM a number

```
<<<<< Program NEWPREM - by Alfred A. Adler Ph.D. >>>>

Do you want to see the normalized premiums? : NO

################### INTRODUCTORY DATA ####################

Stock Symbol, Remarks : NWA
Do you want predictions of puts or calls? CALLS
Can you state the time function constants? YES
A = 51.893012
B = 1.6790825

#####  ENTER PARAMETERS FOR PREDICTED OPTION PREMIUMS  ######

***  Do you want a table of premiums for 9 options on a  ***
     chosen day for a chosen stock price, or do you want
     a graph of the premium for 1 option on a chosen day
     over a range of stock prices : T or G? G

Choose the exercise price desired : 30
Choose the expiration month : MAY
What is the expiration day no. for this month? 139

What is the day no. for which premiums are to be predicted? 21

Readability of graph is best when difference between
   starting and ending stock price is evenly divisible by 5.
At what stock price should the graph start? 25
At what stock price should the graph end?   35
How many lines would you like to skip so that the graph can
   start at the beginning of the next page? : 0


###########  GRAPH FOR MAY 30 CALLS ON DAY NO. 21  ###########

PREMIUM
 6      --!----!----!----!----!----!----!----!----!----!----!X-
          !    !    !    !    !    !    !    !    !    !    X
 5.5    --!----!----!----!----!----!----!----!----!----!--X-!--
          !    !    !    !    !    !    !    !    !    ! X  !
 5      --!----!----!----!----!----!----!----!----!----X----!--
          !    !    !    !    !    !    !    !    !   X!    !
 4.5    --!----!----!----!----!----!----!----!----!-X--!----!--
          !    !    !    !    !    !    !    !    !X   !    !
 4      --!----!----!----!----!----!----!----!---X!----!----!--
          !    !    !    !    !    !    !    !  X !    !    !
 3.5    --!----!----!----!----!----!----!----!X---!----!----!--
          !    !    !    !    !    !    !   X!    !    !    !
 3      --!----!----!----!----!----!----!-X--!----!----!----!--
          !    !    !    !    !    !    !X   !    !    !    !
 2.5    --!----!----!----!----!----!--X-!----!----!----!----!--
          !    !    !    !    !    !X   !    !    !    !    !
 2      --!----!----!----!----!---X!----!----!----!----!----!--
          !    !    !    !    !X   !    !    !    !    !    !
 1.5    --!----!----!----!-X--!----!----!----!----!----!----!--
          !    !    !  X !    !    !    !    !    !    !    !
 1      --!----!-X--!----!----!----!----!----!----!----!----!--
         X!    !    !    !    !    !    !    !    !    !    !

        25.00     27.00     29.00     31.00     33.00     35.00
                            STOCK PRICE

What is the day no. for which premiums are to be predicted? 41

Readability of graph is best when difference between
   starting and ending stock price is evenly divisible by 5.
At what stock price should the graph start? 25
At what stock price should the graph end?   35
How many lines would you like to skip so that the graph can
   start at the beginning of the next page? : 0


###########  GRAPH FOR MAY 30 CALLS ON DAY NO. 41  ###########

PREMIUM
 6      --!----!----!----!----!----!----!----!----!----!----!-X
          !    !    !    !    !    !    !    !    !    !    !X
 5.5    --!----!----!----!----!----!----!----!----!----!----X--
          !    !    !    !    !    !    !    !    !    ! X  !
 5      --!----!----!----!----!----!----!----!----!----!-X--!--
          !    !    !    !    !    !    !    !    !   X    !
 4.5    --!----!----!----!----!----!----!----!----!---X!----!--
          !    !    !    !    !    !    !    !    ! X  !    !
 4      --!----!----!----!----!----!----!----!----!X---!----!--
          !    !    !    !    !    !    !    !   X!    !    !
 3.5    --!----!----!----!----!----!----!----!--X-!----!----!--
          !    !    !    !    !    !    !    !X   !    !    !
 3      --!----!----!----!----!----!----!----X----!----!----!--
          !    !    !    !    !    !    !  X !    !    !    !
 2.5    --!----!----!----!----!----!----!X---!----!----!----!--
          !    !    !    !    !    !   X!    !    !    !    !
 2      --!----!----!----!----!----!-X--!----!----!----!----!--
          !    !    !    !    !    X    !    !    !    !    !
 1.5    --!----!----!----!----!-X--!----!----!----!----!----!--
          !    !    !    ! X  !    !    !    !    !    !    !
 1      --!----!----!---X!----!----!----!----!----!----!----!--
          !    ! X  !    !    !    !    !    !    !    !    !

        25.00     27.00     29.00     31.00     33.00     35.00
                            STOCK PRICE

What is the day no. for which premiums are to be predicted?
STOP IN LINE 935
READY
BYE
+
```

Figure 2

Stocks, cont'd...

of rather comprehensive sample runs are presented. The first of these is shown in Figure 1 where the program is used to predict future premiums for call options based on the stock of Northwest Airlines. It is assumed that the time function constants are unknown. A data base must therefore be loaded and since, in this case, the market has been rather quiet, it has been decided that premiums for three expiration months, at two exercise prices each, on two different days, would provide a satisfactory base. Incidentally, the reader should be aware that the data used in these sample runs is historically correct. These are real-world runs,not invented data.

Referring to the TABLE OF NORMALIZED OPTION PREMIUMS for DAY 1, note that the normalized premium for the NOV 30 option is very different from that of the NOV 25, and similarly for the FEB's. From this it is concluded that either the NOV 30's and the FEB 30's are overpriced or else the corresponding 25's are underpriced. Referring to the TABLE for DAY 2, we note, since the premiums in each column are very close to each other, that the option premiums on that day were unusually self-consistent.

A tabular prediction format has been selected for this run and premiums have been requested for February, May, and August calls with exercise prices of 25, 30, and 35. For the first table, a prediction day approximately four weeks prior to the expiration of the FEB's has been chosen, along with an assumed stock price on that day of $31.5. Note that a time value of only $.07 has been assigned to the FEB 35 by the program, rising to $.16 for the FEB 30, and then dropping to $.04 for the FEB 25. These latter figures are obtained by observing that the intrinsic value of the 30's is $1.50 and that of the 25's is $6.50. Note that the time value assigned to the options with more distant expiration dates is considerably higher, but rises more and more slowly (nonlinearly) as the time to expiration increases.

The second table presents premiums for the same day, but with the somewhat less optimistic assumption that the stock price on that day will be only $28.5 per share. Note that the time values of the 30's are the same as before and those of the 35's and 25's have reversed themselves. This is due to the fact that the second chosen stock price, $28.5, is as far below the exercise price, $30, as the first stock price, $31.5, is above it.

The third table is based on a prediction day only one week prior to the expiration of the FEB's and an assumed stock price on that day of $31.5, the same as was assumed in the first table. The time values for the FEB options are now down to $.01 or less, again rising nonlinearly as the time to expiration increases.

The second run, presented in Figure 2, is as similar as possible to the first run except for the change from a tabular to a graphical display. Since the first run has provided the time function constants, there is no need to either reload a data base nor to reexamine the normalized premiums.

The first graph presents premiums for the MAY 30 call approximately four weeks prior to the expiration of the FEB options (same day as Table 1 of Figure 1), over an assumed stock price range on that day of $25 to $35. Note that the time value of the option decreases as the stock price departs in either direction from the exercise price of the option. This point was discussed previously in some detail.

The time value tends to be greatest when the two are very close and drops off to near zero when the discrepancy is very large.

The second graph shows premiums for the same conditions except that the prediction day is now one week prior to the expiration of the FEB's (as it was in Table 3 of Figure 1). Note that the time value of the option has decreased across the board due to the decreased time to expiration, and that the decrease tends to be greater where the stock price is close to the exercise price of the option than where they are far apart.

Predicted premiums for puts are presented graphically in Figure 3. Since the laying of a data base has already been demonstrated there does not seem to be much point in repeating the process. For this reason, arbitrary (but not unreasonable) values of the time function constants were chosen. The first graph of Figure 3 shows put premiums for the same day as the second graph of Figure 2 over an assumed stock price range on that day of $25 to $35. Note again that the time values decrease as the assumed stock price departs in either direction from the exercise price of the put.

The second graph is simply a magnification of that part of the first graph that lies between assumed stock prices of $29 and $31.

Selection Of A Data Base

As was pointed out in the beginning of this article, option premiums are highly volatile and often change drastically as investor optimism changes, even in the absence of significant changes in stock price or time. That being the case, the secret of laying a good data base is first of all to try to select data that is 'typical' as opposed to 'far out,' and second of all to use enough data so that the effects of any aberrant values that do creep in will be drowned out. The definitions of 'typical' and 'far out' will be left to the user, which explains why the selection of a data base is an art and not a science. Certain caveats are in order, however, as discussed below.

The user must engrave upon his mind the fact that the results, that is, the predicted option premiums, will depend on the choices made in creating the data base.

A data base consisting of premiums for one exercise price, for three expiration months, on one day, is an absolute minimum. This serves to establish the effect of time and the price level. If the user is fortunate enough to have chosen a very typical and self-consistent day, he may in fact have a reasonably valid data base. The use of premiums for three exercise prices straddling the stock price, for three expiration dates, and on four days a week apart, usually gives excellent results. Note that this data base covers a month of trading which tends to smooth out daily fluctuations in investor sentiment. If, however, during that month there has been a recognizable change in market sentiment, such a data base would not be valid.

There are many periods, most of the time in fact, when investor sentiment remains virtually the same for many months. Data bases formed during that period remain valid until a change occurs. When a change does occur, however, it often comes with a bang. Option premiums relative to stock price may double or halve within a few days. Obviously, when this occurs a new data base is needed and the future must be replanned. There are other periods, a small minority of the time, when investor sentiment is continually on the move. It is difficult to form meaningful data bases during such a period, since a change may be needed before the strategy matures. Thus, it is crucial that the data base be laid during a market period wherein investor sentiment is similar to that expected to prevail during the period for which predictions are required.

As the user becomes more experienced he will find that his proficiency at making the right choices improves with startling rapidity. One of the best ways of learning proper choices is to select a group of data for a

base and determine the time function constants and the predicted option premiums. Then either double the amount of data used or cut it in half and observe the effect of the change on the results. This should be done with a number of different stocks as the results will vary widely. A bit of experimentation along these lines will bring on the smarts rapidly.

Conclusions

The price of an option, the premium, is the sum of the intrinsic value and the time value. The former is secured by the spread between the stock price and the exercise price of the option (if in the right direction). The latter is simply the value, if any, that investors put on the potential for appreciation.

Algorithms have been developed for the variation of option and premium with time, at a fixed arbitrary value of stock price, and for the variation of option premium with stock price at a fixed arbitrary time. The constants in these algorithms may be determined from consideration of a data base consisting of historical values of pertinent option premiums. The algorithms may then be combined to predict future option premiums as a function of time and stock price. Program NEWPREM accepts such historical data as the user chooses, sets up the algorithms, and presents predictions of option premiums under user selected conditions, in either tabular or graphical form.

Selection of the data base is an art, not a science.

Selection of the data base is an art, not a science. It is necessary that the data used in the base be derived during market periods wherein investor optimism (or pessimism) is at the same level as that expected during the period for which predictions are desired. It must be realized that the predicted option premiums will depend very much on the choices made in creating the data base.

Program NEWPREM, along with OPGRAPH and OPTION already presented, and PORTVAL to be presented next month, is available in several forms. A TRS-80 version on cassette for 16K Level II is available from *Creative Computing Software*. A disk version in North Star Basic, single or double density, as well as an Applesoft version, cassette or disk, is available from the author. □

```
<<<<<  Program  NEWPREM  -  by  Alfred  A. Adler  Ph.D.  >>>>

Do you want to see the normalized premiums? : NO

####################  INTRODUCTORY  DATA  ####################

Stock Symbol, Remarks : NWA
Do you want predictions of puts or calls? PUTS
Can you state the time function constants? YES
A = 50
B = 5

#####  ENTER PARAMETERS FOR PREDICTED OPTION PREMIUMS  ######

***  Do you want a table of premiums for 9 options on a  ***
     chosen day for a chosen stock price, or do you want
     a graph of the premium for 1 option on a chosen day
     over a range of stock prices : T or G? G

Choose the exercise price desired : 30
Choose the expiration month : MAY
What is the expiration day no. for this month? 139

What is the day no. for which premiums are to be predicted? 41

Readability of graph is best when difference between
   starting and ending stock price is evenly divisible by 5.
At what stock price should the graph start? 25
At what stock price should the graph end?   35
How many lines would you like to skip so that the graph can
   start at the beginning of the next page? : 0


############  GRAPH FOR MAY 30 PUTS ON DAY NO. 41  ############

PREMIUM
        X|    |    |    |    |    |    |    |    |    |    |    |
 5.5   --X----|----|----|----|----|----|----|----|----|----|----|--
         |X   |    |    |    |    |    |    |    |    |    |    |
 5      --|--X-|----|----|----|----|----|----|----|----|----|----|--
         |   X|    |    |    |    |    |    |    |    |    |    |
 4.5    --|----|X---|----|----|----|----|----|----|----|----|----|--
         |    | X  |    |    |    |    |    |    |    |    |    |
 4      --|----|---X|----|----|----|----|----|----|----|----|----|--
         |    |    X    |    |    |    |    |    |    |    |    |
 3.5    --|----|----|-X--|----|----|----|----|----|----|----|----|--
         |    |    |  X |    |    |    |    |    |    |    |    |
 3      --|----|----|----X----|----|----|----|----|----|----|----|--
         |    |    |    |X   |    |    |    |    |    |    |    |
 2.5    --|----|----|----|--X-|----|----|----|----|----|----|----|--
         |    |    |    |    X    |    |    |    |    |    |    |
 2      --|----|----|----|----|-X--|----|----|----|----|----|----|--
         |    |    |    |    |    X|    |    |    |    |    |    |
 1.5    --|----|----|----|----|----|-X--|----|----|----|----|----|--
         |    |    |    |    |    |    X    |    |    |    |    |
 1      --|----|----|----|----|----|----|---X|----|----|----|----|--
         |    |    |    |    |    |    |    |    X    |    |    |
 .5     --|----|----|----|----|----|----|----|----|----|----|----|X-

        25.00      27.00      29.00      31.00      33.00      35.00
                                STOCK PRICE

What is the day no. for which premiums are to be predicted? 41

Readability of graph is best when difference between
   starting and ending stock price is evenly divisible by 5.
At what stock price should the graph start? 29
At what stock price should the graph end?   31
How many lines would you like to skip so that the graph can
   start at the beginning of the next page? : 0


############  GRAPH FOR MAY 30 PUTS ON DAY NO. 41  ############

PREMIUM
      X |    |    |    |    |    |    |    |    |    |    |    |
 2.2   --|-X--|----|----|----|----|----|----|----|----|----|----|--
         |    |X   |    |    |    |    |    |    |    |    |    |
 2      --|----|----X----|----|----|----|----|----|----|----|----|--
         |    |    |    X    |    |    |    |    |    |    |    |
 1.8    --|----|----|----|---X|----|----|----|----|----|----|----|--
         |    |    |    |    |   X|    |    |    |    |    |    |
 1.6    --|----|----|----|----|----|---X|----|----|----|----|----|--
         |    |    |    |    |    |    |  X |    |    |    |    |
 1.4    --|----|----|----|----|----|----|----|----X----|----|----|--
         |    |    |    |    |    |    |    |    |    | X  |    |

        29.00      29.40      29.80      30.20      30.60      31.00
                                STOCK PRICE

What is the day no. for which premiums are to be predicted?
STOP IN LINE 935
READY
BYE
+
```

Figure 3

Don't Write That Program!!

Stephen Kimmel

A controversial piece, this: it assumes that a computer program exactly replaces something we do already, and that programs are written for practical reasons. Rebuttals are invited.

There is a limited number of programmers out there and a limited amount of time to be spent. So why are we wasting so much time writing worthless programs? Despite millions of words on how to write programs, there doesn't seem to be anything on what to program. How can you begin to write a computer program without first picking something to computerize?

The answer to this lack of guidance is simple. You can write good programs about an unlimited number of things. Well, not quite unlimited. The guidelines are negative rather than positive. They are "Don't writes" rather than "Write abouts." My students and I have formulated the following rules to serve as a guide.

1. *Don't write that program unless the task is something you do frequently.*

By frequently we mean more than twice a year. The reasoning is twofold. First, unless you know what you are doing, you won't be able to teach a computer to do it. Can you really know your subject if you only use that knowledge once a year? Second, it will take you at *least* (and that's if you are very fast and very good) three times as long to program a computer to do something as it would take you to do it yourself. If you only use the program once or twice a year then you haven't done yourself much good.

For every computer program you write, you *must* have a correct example to use to check the computer against. Nobody, I repeat, nobody writes programs that are free from errors every time. Every program must be checked and tested. Some of the errors will appear obvious like the program that told you to add negative eggs to your souffle. Other errors will be more insiduous, parading as reasonable answers.

It bears repeating. You must have a correct example to check the program.

The classic example of a bad program to write under this rule is an Income Tax program. You would have to work your income tax by hand to have the correct example to test the program. In the final analysis, doing your income tax using a program that you wrote would take you from three to six times as long. And you would have to rewrite the program every year since that's how often they change the laws.

If the computer is to free minds for more important things, it must enable them to do the mundane tasks in less time.

The exception, of course, is if you are planning to sell the program or a tax service. But then you are doing income taxes more than once a year. I don't even recommend buying an income tax program. Unless the manufacturer is prepared to guarantee the answers, and they aren't, you still have to check the answers. That means working it by hand.

The second exception is the second rule.

2. *Don't write that program unless the task is something you would do more often if it were easier to do.*

In its simplest terms this is what computer power means.

3. *Don't write that program if a human could do the same thing in less than five minutes.*

All of the first three rules can be reduced to a single variable — time. If the computer is to enrich the lives of humans, if the computer is to free minds for more important things, it must enable them to do the mundane tasks in less time. If it fails that test, if perchance it actually takes longer to do the task with a computer, then the computer becomes a hindrance rather than an aid.

Consider an example from a commercially available program. The idea is to convert recipes. You are in the kitchen preparing a meal for 46 of your most intimate friends. However, your recipe only makes enough for twelve. You can:

Take the cookbook to the computer (spare bedroom)	30 seconds
Turn computer on (two buttons)	2 seconds
Enter Interpreter, Utility, etc.	1 minute
Enter Recipe Conversion Program	30 seconds
Run program (and write down answers)	1 minute
Turn computer off	2 seconds
Return to kitchen	30 seconds
Total time	3:34

Or you can:

Go to den and get calculator	20 seconds
Turn on calculator (one button)	1 second
Perform operation (and write down answers)	3 minutes
Turn off calculator	1 second
Return to kitchen	20 seconds
Total time	3:42

Or you can use man's traditional solution

Fake conversion mentally	10 seconds

Or you can use man's other traditional solution

Make enough for 48 and serve slightly larger portions	0 seconds

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Stephen Kimmel, 4756 S. Irvington Place, Tulsa, OK 74135.

is less than 8 seconds. Even if you have a disk, so the program loads instantly, you have still saved less than two minutes, and lost a couple of minutes compared to normal operation. And assuming you did save some time, what would you do with those extra two minutes you bought? You sit there and watch your four-foot diameter cake fall — or perhaps spend it walking back to your computer to save some more time.

The five-minute figure is strictly arbitrary, but it is a good guideline. The less your time is worth the shorter it will be.

4. *Don't write that program to do something that could be done better with a:*

a. $10 calculator — such as balance your checkbook.

b. $2 file box and some 3x5 cards — such as your Christmas Card list . . . unless you plan on having the computer print address labels . . . which is inconceivably gauche.

c. $5 calendar and a 5¢ pencil — such as your appointment book.

Not only can you balance your checkbook, update your mailing list and make a note of a future date faster by hand than you can by computer, but you can do it a lot cheaper. The physical acts are about the same. The computer has all that overhead (such as walk to the computer, load the program, etc.), and it has other constraints such as limited memory, restricted data forms. And you spent four hours programming it to do each of those things. The computer in those applications is a waste of time and money.

Why does anybody use a computer for these things? Easy. They bought it and they have to do something with it.

Finally;

5. *Don't write a computer program if accuracy doesn't matter.*

People have survived for centuries by balancing their budgets only approximately.

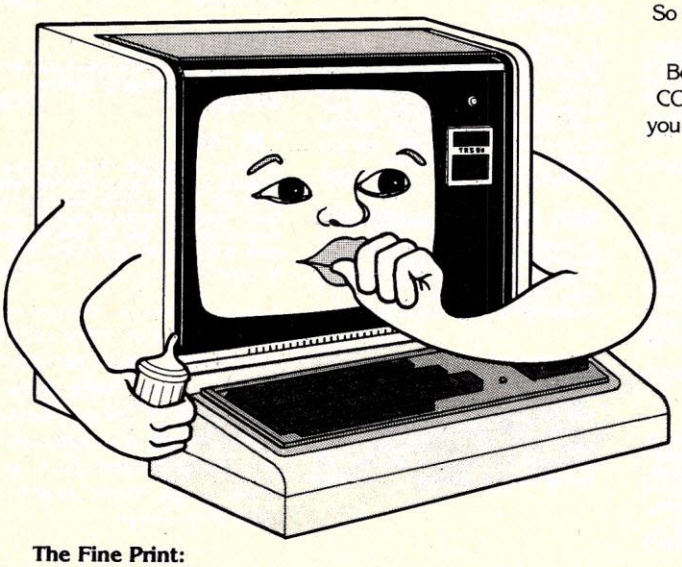
The computer may be able to tell you that you need to buy 12.76 pizzas when you would have guessed 13. The problem is that it doesn't make any difference. You still have to buy 13 pizzas. There are no savings in either time or money. There is only the vague increased assurance that you are a good guesser and the vague creeping doubt that you wasted your money buying that computer in the first place.

The applications of this are myriad. People have survived for centuries by balancing their budgets only approximately. It is possible that the savings on decreased leftovers will eventually pay for the computer, but I doubt it.

There are too many worthwhile things to program for all this effort to be spent writing programs that stifle and hinder the human rather than doing what the computer is supposed to do; release the human for bigger and better things. All you have to do is to use a little imagination to get past the worthless and into the worthwhile. □

"Right now it's counting the calories I consumed last week."

GOO-GOO, GAA-GAA, REA-DEE...



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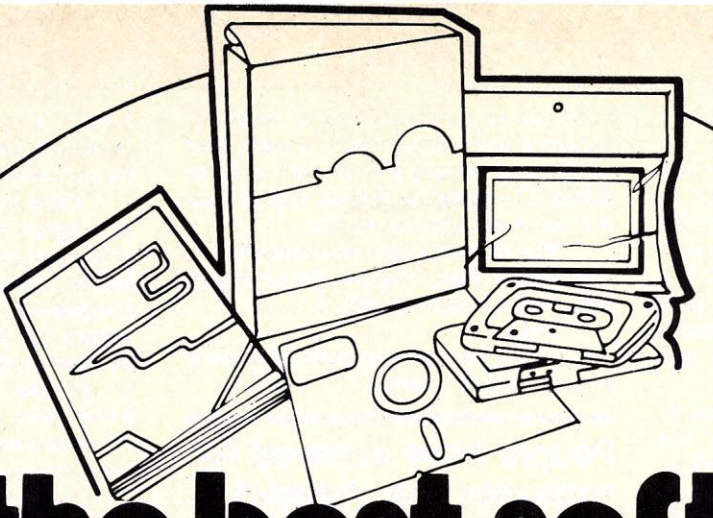

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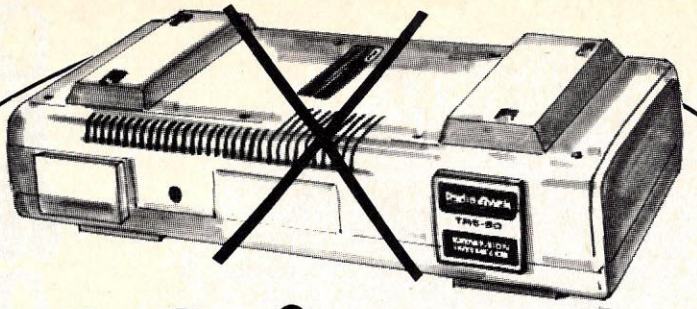

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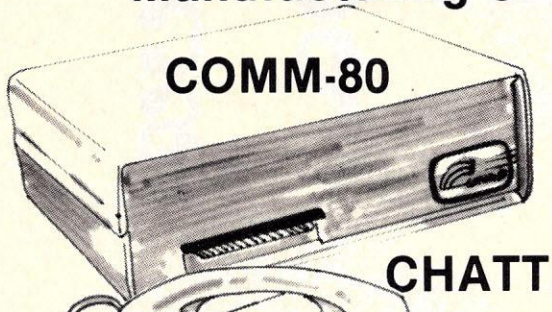

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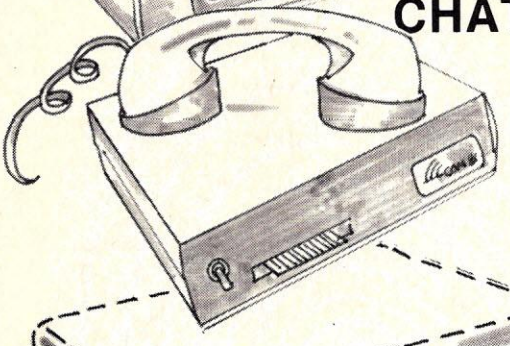

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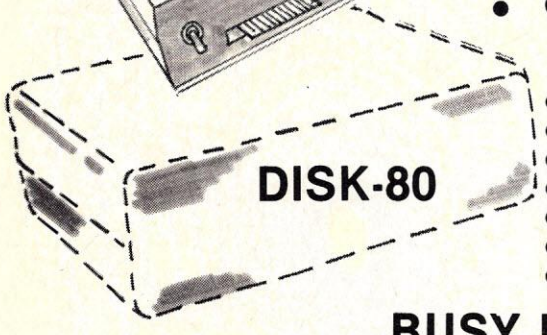

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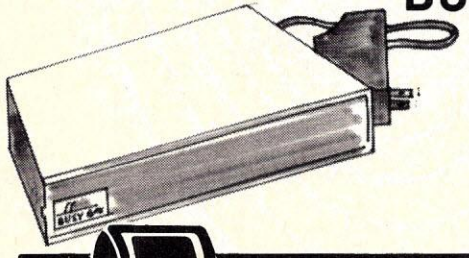

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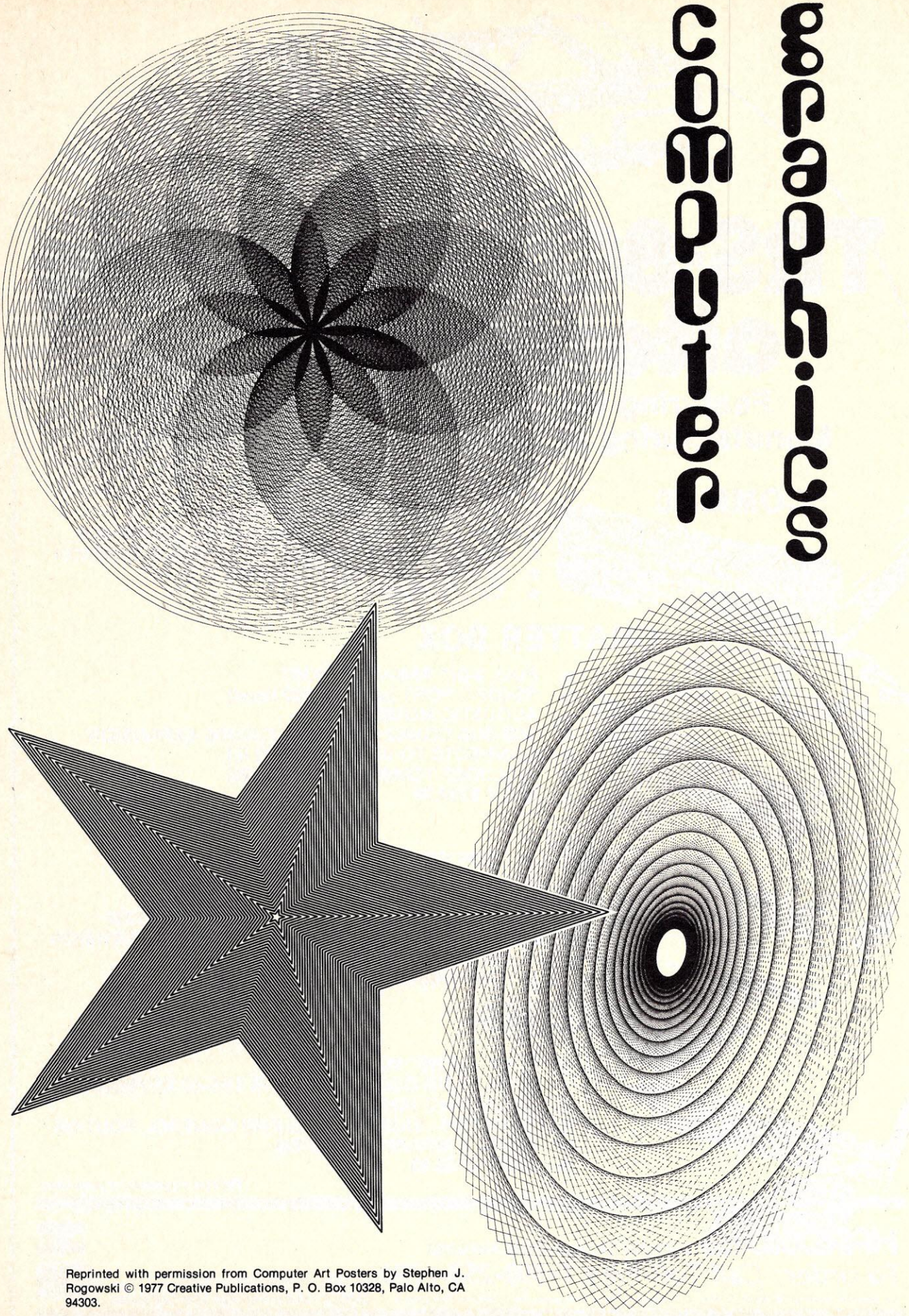

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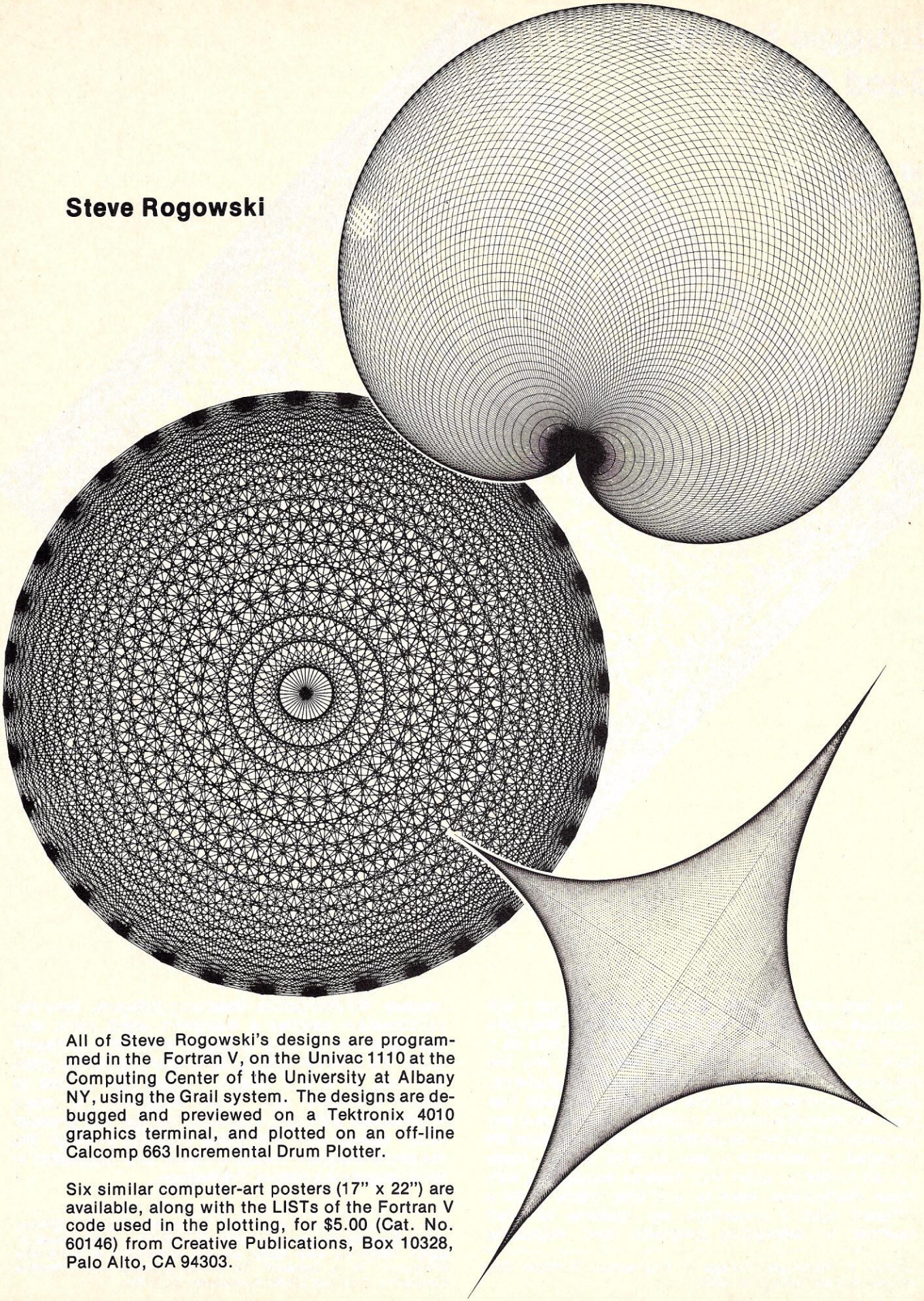
Steve Rogowski



All of Steve Rogowski's designs are programmed in the Fortran V, on the Univac 1110 at the Computing Center of the University at Albany NY, using the Grail system. The designs are debugged and previewed on a Tektronix 4010 graphics terminal, and plotted on an off-line Calcomp 663 Incremental Drum Plotter.

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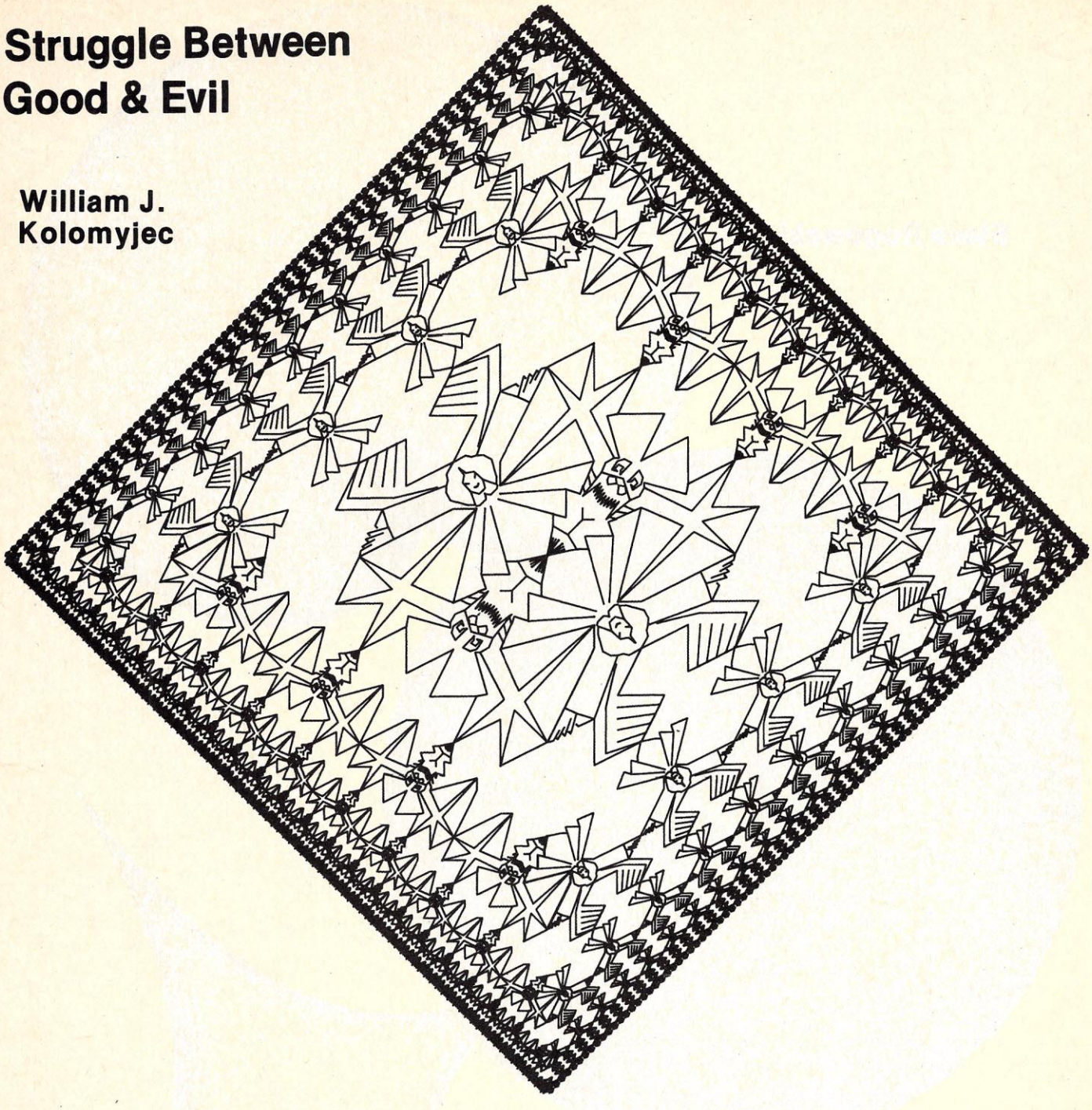
Struggle Between Good & Evil

William J. Kolomyjec



As long as I can attain access to a computer I will continue to use it. It is my medium! Here at Michigan State University I have taught computer graphics as a form of expression for the past two years and the response has been overwhelming. Many art students, after an involvement with the computer, discover that there are objective methods to problem solving and any preconceived notions about the 'ominous' computer are dispelled, it becomes a tool in their hands. Many non-art students, when they become acquainted with visual phenomena, learn to 'see' their world under a different light. I encourage my students to work together in debugging programs and evaluating imagery. All take part in classroom critiques. Here the collaboration reaches a maximum when artist and non-artist explain what thoughts underlie a particular work. The effort in making computer graphics is great but then so is the reward. I encourage anyone to spend the time and effort necessary in one's involvement with this medium. Perhaps the greatest return comes from the works themselves when the neophyte computer artists discover that embedded in their imagery is a little of themselves.

William J. Kolomyjec, College of Engineering, Michigan State University, East Lansing, MI 48824.

Text excerpted from "Artist and Computer." Ten of William Kolomyjec's are reproduced in the book, showing a wide diversity of styles. Thirty-four other artists are also represented in "Artist and Computer." It is available for $10.00 postpaid from Creative Computing, P.O. Box 789-M, Morristown, NJ 07960.

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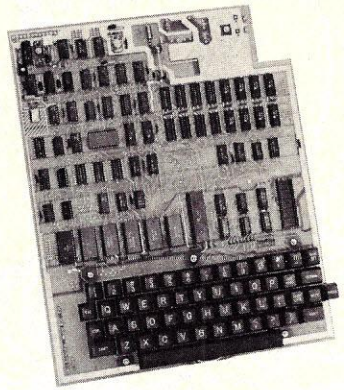

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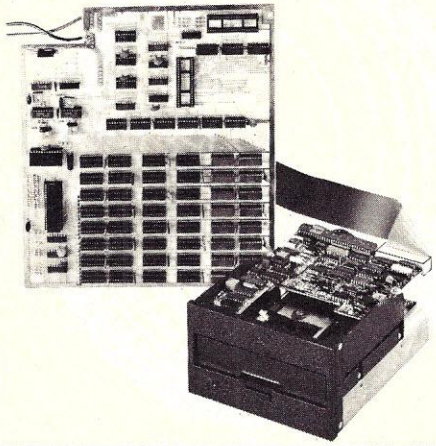

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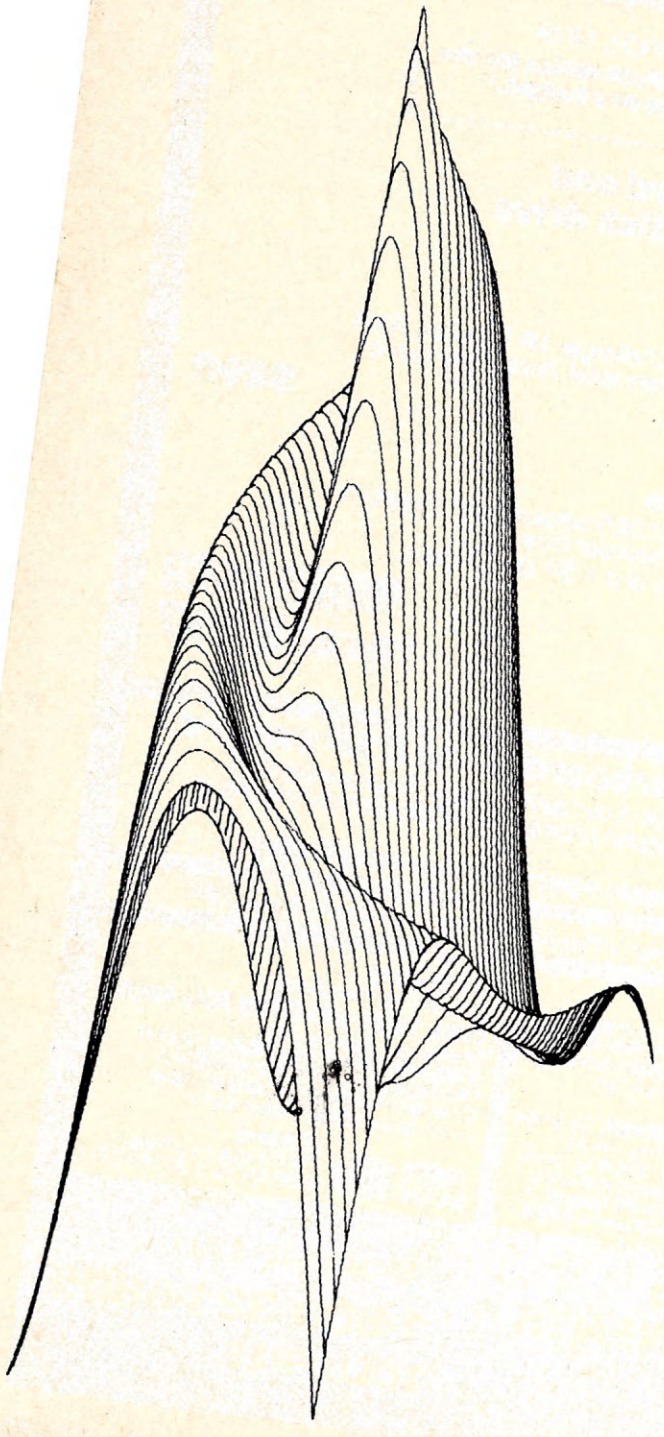
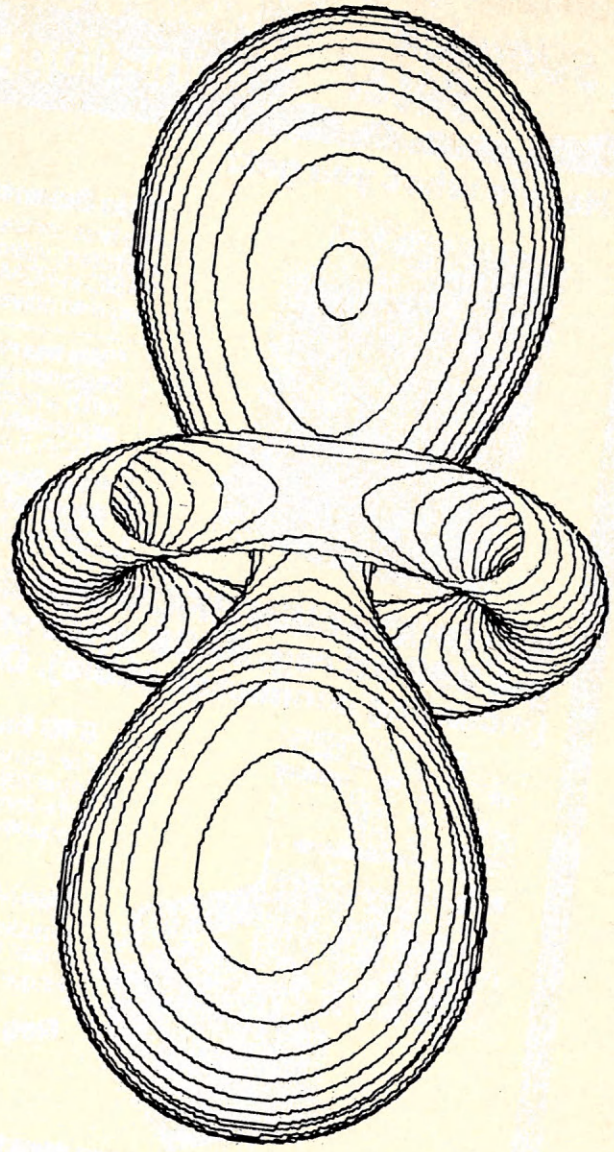
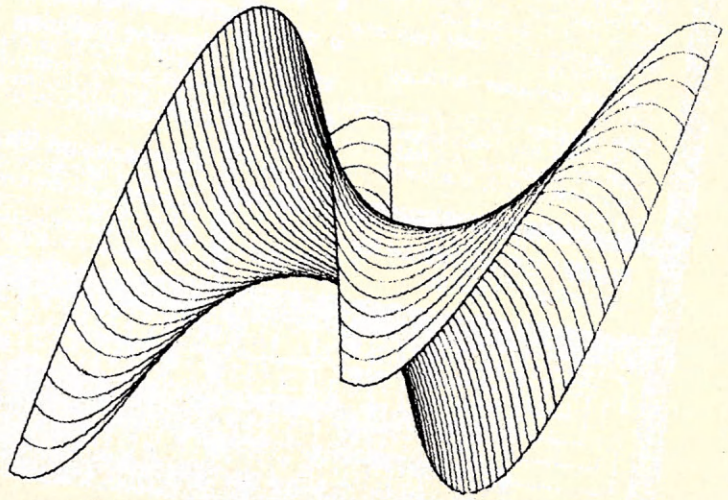
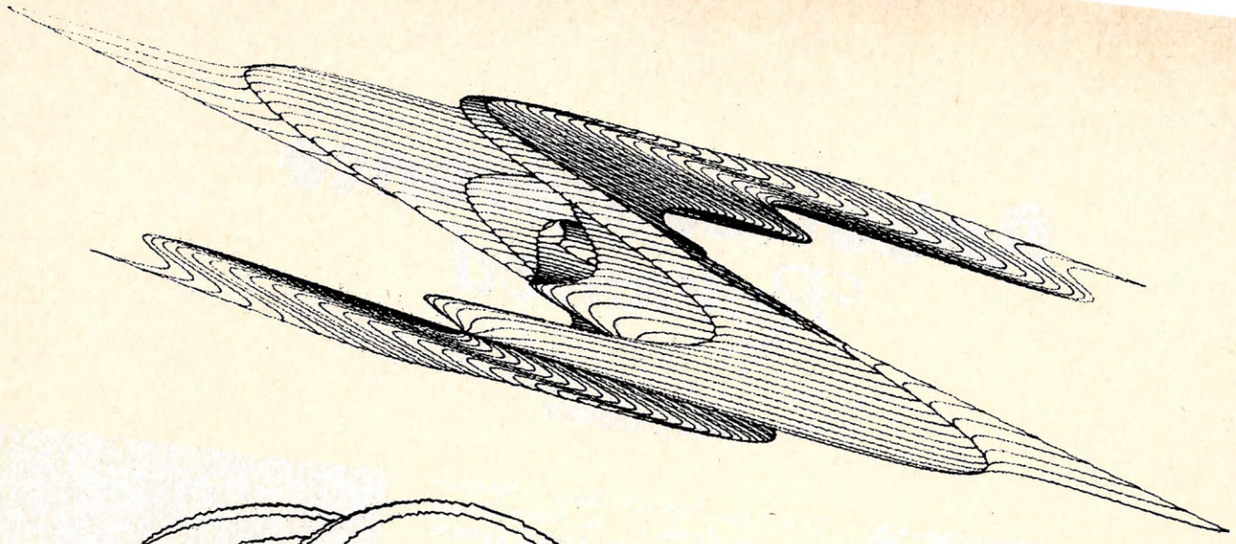
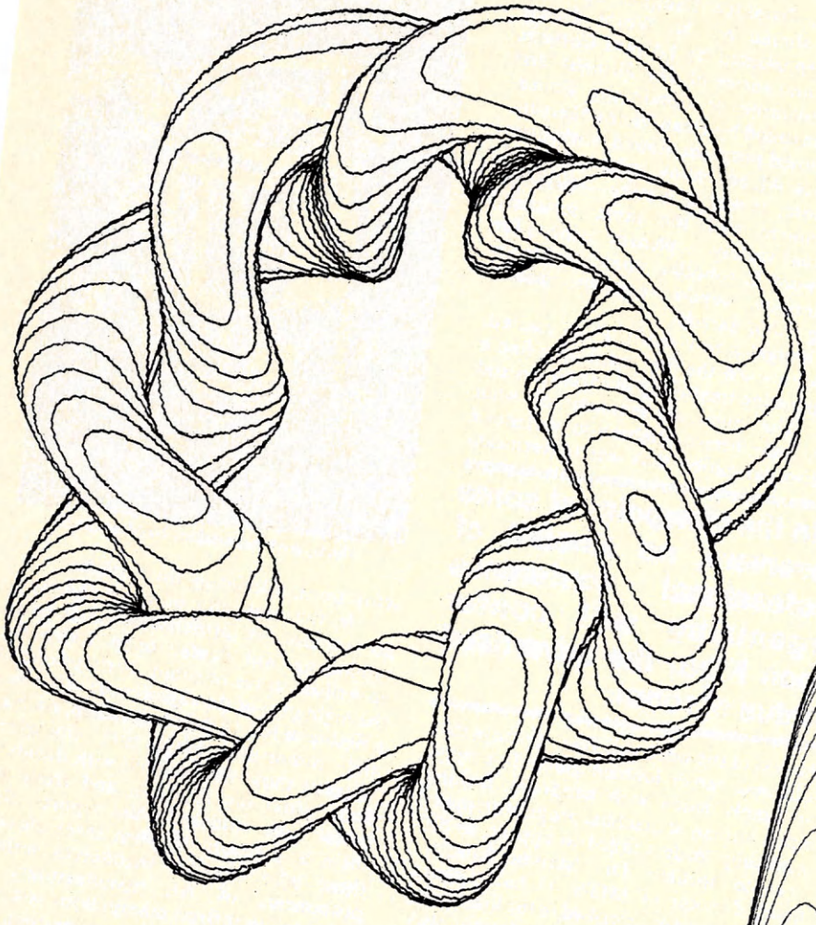
By Nick Mykris with David Ballew, Dept. of Mathematics, South Dakota School of Mines and Technology.

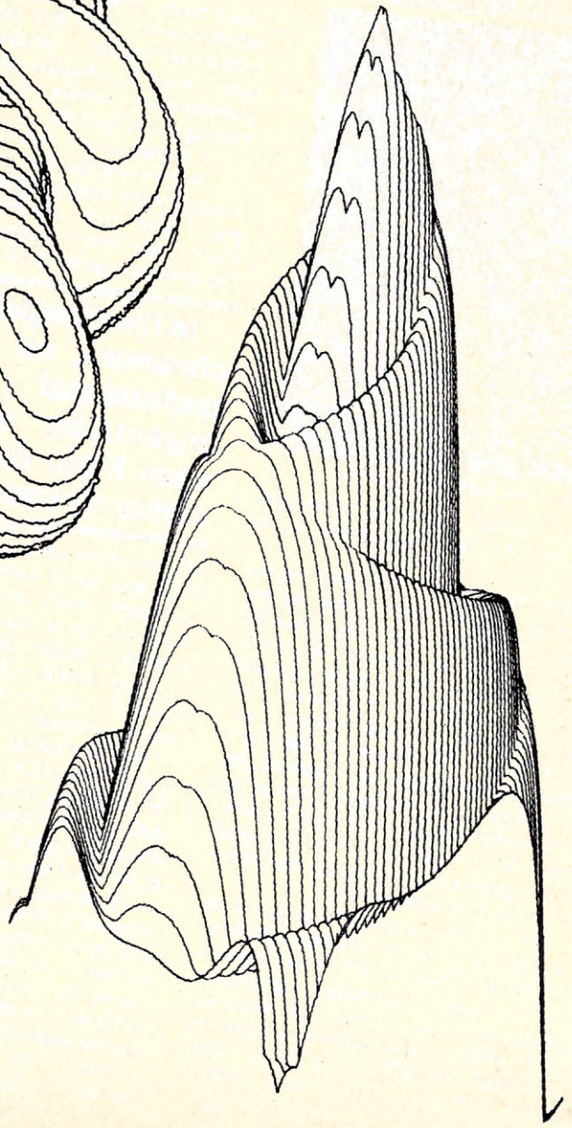








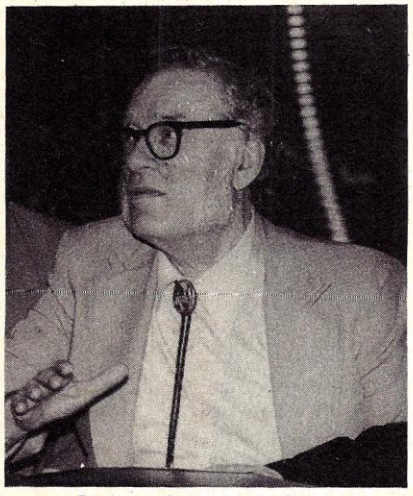




Robot Conference *Reviewed*

Abby Gelles

Even though there are no real robots and may never be, for some reason the longing for robots (slaves? companions?) fires many people. Here's the latest word from the robot nostalgia front. —*TN*



Dr. Isaac Asimov on robots.

The brochure promised adventure. Aha, I thought, take the subway to the future.

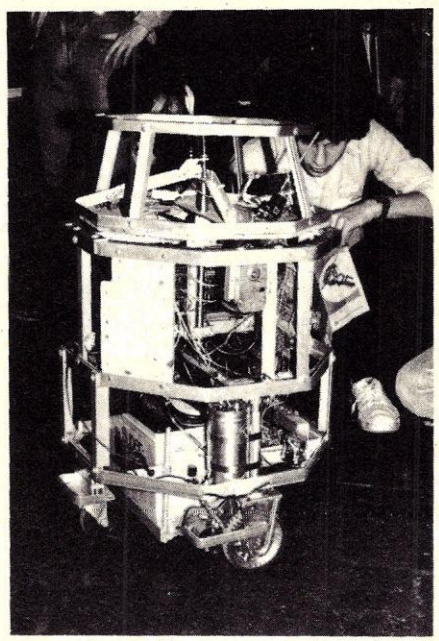
There was, admittedly, more on my mind than just an opportunity to experience some novel magic. There was the nagging necessity to sponsor my forthcoming books — a set of teacher's manual and student/hobbyist workbook for junior/senior high school students entitled *Robotics Curriculum*. I called my publisher. "We've got to go!" I cajoled. He called and got us an exhibition spot at the first International Conference on Robotic Futures. My first stab at the promotional circuit promised a weekend of hobnobbing with droids and superstars.

The conference assumed the subtitle "Towards a Creative Human/Machine Relationship," and offered as participants in this creative relationship such notable humans as Isaac Asimov and machines such as Quasar's Klatu (introduced as the star robot) and R2D2. The dates: April 25-27, 1980; the place: Long Island University, Brooklyn Campus. Sponsorship was shared by the World Future Society, represented by Edward Cornish, president and editor of *The Futurist*, and L.I.U.'s Institute of Continuing Education, represented by Dean Victor Marrow. The proposed program offered workshops in robotics, AI, education, cybernetics and much more, as well as movies — first-run entertainment and the more seriously intellectual variety — plenary sessions for future work in robotics, mime and dance presentations, vendor exhibits, and a rousing robot parade.

I bought a new outfit. I was excited.

We arrived the first evening to find a disappointing smattering of exhibitors and press. The quiet atmostphere of what should have been a celebration portended the disorganization that was to permeate the rest of the weekend. Over the days that followed, tables loomed gloomily empty, or simply laden with handouts, lacking either human or machine proprietor; many workshop leaders failed to appear, as did keynote speaker Dr. Marvin Minsky, noted director of MIT's AI Lab. Others were incorrectly described in the literature, or late in arriving. Even Dr. Asimov was several hours late, dependent on a lift from the sponsors, who themselves arrived for their precious cargo well after the time he was due to speak. An attendance of 11,000 at the gate was projected, but perhaps 10 to 20 percent of this figure would more accurately describe the actual "crowd," and most of these were L.I.U. students or curious passersby. The conference obviously suffered from lack of followup beforehand and the need of stronger managerial leadership. We were advised by the organizers that next year's effort will be taken over by a professional conference setup team, alleviating the bedlam.

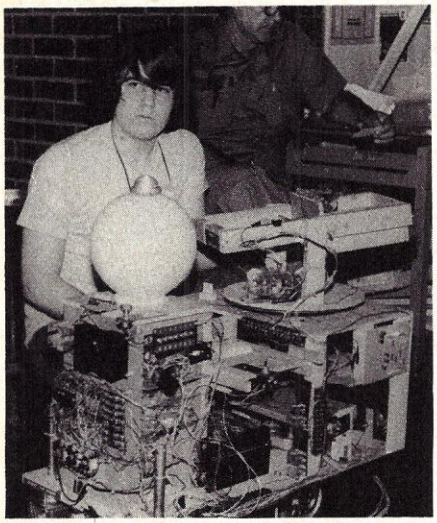
In the viewpoint of some observers, no amount of professional conference organizing will confer upon Klatu the advertised status of robot.



Herb, with his creator Holden Caine.

In the viewpoint of some observers, no amount of professional conference organizing will confer upon Klatu the advertised status of robot. Perhaps one of the highlights of the experience for me was a firsthand feel of the competition, politics and rumor-mongoring that transpires between those who dabble with droids. I know from my research, and from my junior high students' class reports, that there is a chasm between three classes: those who consider themselves serious proponents of AI, manufacturers of dedicated industrial manipulator systems, and those who produce promotional or entertainment devices with interesting shells. This pecking order causes each of these groups in turn to discredit the output of the next in line as real robots. Outfits such as Quasar make good copy, as articles appear whispering that microphones imbedded in the body of Quasar droids substitute for brain power. Klatu is an entertainer. He bleeped and joked and rapped with the folks all weekend, generally creating a momentum where there might have been disappointing quietude.

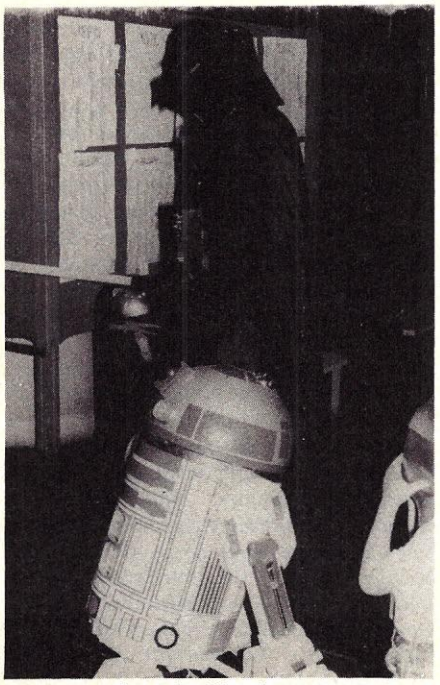
Abby Gelles, 185 West Houston St., NY, NY 10014.



"Mobot", a homebrew robot, with creator Peter Quinn.

If he houses remote control or microphonic conversational facilities, then credit lies with his masters for their ability to put on a good show. They know their business, and their market. However, I was a bit abashed that the firm had the gall to *sell* its promotional material to gullible children for 75 cents a copy!

Despite the disorganization evident throughout the conference, there were some excellent and notable high points. Among my own experiences, I watched a very fine filmed record of a conversation between Margaret Mead and other anthropologists, donated by New York's Museum of Natural History, concerning the future of man in a technological society. I wandered among the vendor tables, asking questions of precocious young robot builders, and received some very sound advice for my own students regarding



Some familiar characters.

Another View

Betsy Staples

The lure of Canal Street, with its used clothing, surplus engine parts, second-hand furniture, discount odds and ends and Chinese grocery stores, was strong as we threaded our way through the traffic between the Holland Tunnel and the Brooklyn Bridge, but we dared not stop — we had a date with the future.

It was the last Saturday in April and we had been invited to participate in the Robotics Futures Conference sponsored by Long Island University at its Brooklyn campus. The Conference was scheduled to run from Friday through Sunday, but we had elected to participate only on Saturday. We arrived in plenty of time to set up our booth, only to discover that our booth had been given away — not that there were hordes of would-be exhibitors lusting after booth space. There were only a few exhibitors, but apparently one of those had liked our booth better than his own.

So, we set up our table in a dimly lit corner of the exhibit hall, unplugged the copy machine so we could run our Apple demo, and prepared for a busy day talking with exciting, future-oriented people.

The first thing we learned was that robotics- and future-oriented people are not necessarily computer-oriented prople. Most of them approached our software display with curiosity: "Do you use these things with those 'Pong' games?" If we needed any further proof, it came when a quick inventory revealed that we had sold all ten copies of *Be a Computer Literate,* our computer literacy text aimed at junior high students, in the first two hours.

A quick turn around the exhibit hall disclosed some of the apparent interests of the attendees. There were two exhibits featuring large, talking, promotional type robots and one homemade model that looked like something from a 1980's version of an Our Gang comedy. There were also several displays of futuristic artwork and tables full of Darth Vader mugs.

Capping off a day of workshops and seminars on robotics and the future was the *piece de resistance,* lectures by Marvin Minsky and Isaac Asimov. At the appointed hour, 4:00 p.m., the attendees filed in to the lecture hall and took their seats, only to be told that there would be a delay — the lecture would begin at 4:15. After a few more such postponements, rumors began to fly: Marvin Minsky had heard that a certain robot had elected not to come and had decided to do the same; Isaac Asimov had never even been invited.

Finally, at about 5:00, Isaac Asimov did appear. He began his talk by announcing that he is "off robots now," but proceeded to provide answers to what were apparently "frequently asked questions," and to describe some of his past involvement with robots.

He explained that at the time, he was unaware that he was inventing the word "robotics." "Robot," the Czech word for "worker," was already in common use. Since all physics words end in "ics," he assumed that "robotics" was a legitimate word and began to use it in his writing.

After asking himself "How did you come to know so much about robots and computers?" he answered, "I don't know a damn thing — never did," and added that he didn't know one had to know anything to write about them.

When he was a child Asimov enjoyed science fiction, particularly stories about sympathetic robots that were designed to be nice. His Laws of Robotics reflect this early preference.

"How come you never mentioned computers in your early robot stories," he asked himself. The answer: robots have existed in human thought almost from creation — they were created in man's image — but nobody thought of computers. In his own writing, he never really distinguished between them, he explained. A computer was an immobile robot and vice versa.

Regarding the Laws of Robotics — they are deliberately ambiguous. "My intention was to write stories and become rich and famous. If the laws were perfect, there would never be any stories." All of his stories, he said, have robots going wrong — violating one or more of the laws.

Asimov feels that just as humans have a driving force to survive, computers have a drive to solve problems. Humans have certain strengths and computers have certain strengths. Why not allow them to evolve as parallel intelligences in a symbiotic relationship? We face a "glorious, boundless, horizonless future, if we can only solve the problems which threaten to destroy us." Presumably computers can help us do that.

Following the lecture, the participants were invited to a much-touted reception for Asimov and the absent Minsky. Asimov arrived late and didn't stay long, which was just as well, since the left-over-from-lunch cold cuts, fruit, cake and wine which passed for refreshments didn't encourage us to lengthen our stay. □

While Asimov's Laws allude to robots as something potentially human-like in nature, Clapp's laws obviously treat them as purely subservient to human goals.

Asimov's Three Laws of Robotics:

1. **A robot may not injure a human being, or, through inaction, allow a human being to come to harm.**
2. **A robot must obey the orders given it by human beings except where such orders would conflict with the First Law.**
3. **A robot must protect its own existence as long as such protection does not conflict with the First or Second Law.**

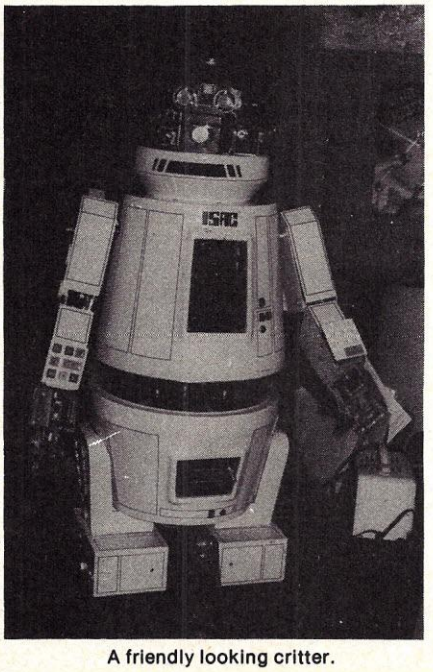
——Handbook of Robotics, 58th edition 2058 A.D.

Clapp's Three Laws of Robotics:

1. **Organizations may not install robots to the economic, social or physical detriment of workers or management.**
2. **Organizations may not install robots through devious or "closed" strategies which reflect distrust or disregard for the work force, for surely they will fulfill their own prophecy.**
3. **Organizations may only install robots on those tasks which, while currently performed by men, are tasks where the man is like a robot, not the robot like a man.**

simple or affordable mechanisms for adding rather sophisticated feedback or computerized features to our class robot. I picked up a brochure describing a project being conducted at NYIT called ADAM II, which led to a delightful acquaintance with the project's professorial head, and promise of future exchange of information and participation in standards work. The one dance I attended was interesting in its multimedia approach.

It was impossible to attend as many workshops as one would like, since, even with some of them cancelled, the concurrent offerings contended for level of interest. I was forced to skip a much desired refamiliarization with the thoughts of James Albus, author of *People's Capitalism* and NASA roboticist), Todd Loofbourrow (prodigious developer of homebrew robot), and Dave Ahl (*Creative Computing*). Also, following the charismatic plenary introduction by Moshe Davidowitz, Rabbi, Humanist Psychologist, and Policy Analyst for the Prometheus Group, I sadly forfeited attending his workshop on "New Mythos for a Mechanized World" in favor of other offerings.



A friendly looking critter.

The Three Rules of Robotics first presented in *I, Robot* now form one of the foundations of modern robotics principles.

However, I did find myself involved in some fascinating discussions. Among them were the discovery of two individuals with whom I was previously unfamiliar. One, Neale Clapp, an independent industrial consultant, is a social scientist who advises management regarding industrial relations with workers. As a result of a contract with GE, Mr. Clapp found himself heavily involved in the introduction of robotic technology among human workers. He has developed his own Three Rules of Robotics, which lay the groundwork for industry in smoothing the industrialization of their currently human labor-intensive tasks.

A second speaker I enjoyed was Ms. Minna Hilton, an expert in the area of "media ecology," who explained, with the aid of a film, how differently each of us hears and perceives reality, due to the fact that our internal models for information decoding vary so greatly in structure. The revelation that while I may think logically, the person to whom I am trying to communicate a concept may possess a more fluid conception process, will greatly influence my teaching, writing and even systems-analysis documenting techniques in the future.

For those interested in games playing, science fiction, robot construction and government objectives in robotics, there were many more workshops available.

Help! I'm lost!

The major highlight, of course, was the anticipated appearance of Isaac Asimov. Perhaps his late arrival served a purpose in hightening the tension of that anticipation. I was particularly anxious to hear his address, as over the years I have found him extremely accessible by telephone and letter, and was curious to find out, if I could from a short speech, a little about what makes this prolific, rollicking Renaissance author tick. What the audience witnessed was a straightforward, kindly, smiling bit of joy from the man who coined the term "robotics." ("How do I know I coined the word," he queried. "I looked it up in the dictionary when I first tried to use it, and found it nonexistent. Years later, I looked it up again, only to find the definition contained a quotation by myself claiming I coined the term!")

My class had written to Dr. Asimov a while back challenging him to alter the Three Rules of Robotics which he first presented in *I, Robot,* and which now form one of the foundations of modern robotics principles. They suggested some consideration be given to the necessity for robots to protect other robots, as well as man, since robots can have intelligence and feelings. They also inquired about his credentials in the field. Apparently the credential challenge is one Isaac Asimov often receives, for he addressed it in his speech, saying simply that he lacked any. When asked how he could have written so many books about computers and robots without any background in either technology, he regularly responds, "I didn't know I needed any!" Thus, one of the world's noted authorities in technological science fiction (and some serious technology, too) rests his opinion on intuition and wit, with some optimism for the future. What a nice thought with which to close the first International Conference on Robotic Futures: Towards a Creative Human-Machine Relationship. □

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The "Knight's-Tour" Problem

Bhairav Joshi

There is an elegant old problem, called the "Knight's Tour," which has attracted the attention of puzzle enthusiasts, mathematicians, and computer programmers. The object here is to discover the itinerary of the Knight (K) through each one of the 64 cells of a Chess-Board (CB) beginning at any one cell. The K is allowed to visit each cell only once as it tours the entire CB.

Motivated by Andy Pauker's recent article describing an algorithm for the solution of this problem (*Computerworld:* July 2, 1979, p. 17), I decided to study it with the ultimate goal of developing an efficient algorithm for solving the problem using a digital computer. This article presents the results of my study.

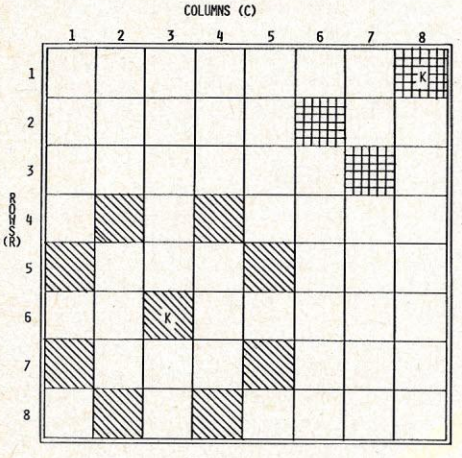


Figure 1

Long before the era of computers, the problem was tackled by great mathematicians like De Moivre, Euler, Legendre, Roget, Warnsdorff, and others. It is now well known that the number of solutions to this problem is greater than 31 *million*! No one seems to know the maximum number of possible solutions. An interesting discussion of some of the elegant solutions of this problem can be found in W. W. R. Ball's book on *Mathematical Recreations and Essays*, 4th edition, Macmillan and Company, Ltd., New York (1905).

One of the earliest ideas suggested for developing solutions to this problem, that is well suited for *computer implementation*, is that due to a German mathematician, J. C. Warnsdorff (1823), now known as Warnsdorff's rule. This heuristic rule, dubbed by mathematicians as 'double-look-ahead,' states that *the K will move to that cell from which the number of cells available during each of the next two moves is smallest*. A detailed description of this rule can be found in volume II of C. F. de Jaenisch's book on *Applications de l'Analyse Mathematique au Jeu des Echecs* (1862).

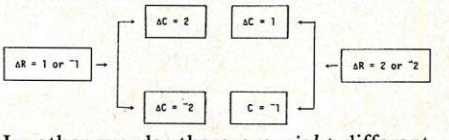
The Knight is allowed to visit each cell only once as it tours the entire Chessboard.

Here I will explore and modify Warnsdorff's rule, and show how the modified rule leads to an efficient algorithm for obtaining 64 solutions — each with a different starting cell. I will show that each cell of the CB has a characteristic place-value which alone needs to be invoked in deciding the next move of the K. I will also prove that there are only ten unique cells in a CB where the K can *start*. Finally, I will present an APL implementation of my algorithm illustrated by typical results.

Knight's Moves on a Chess Board

A chess board (CB) is shown in Figure 1. It consists of 8 rows and 8 columns of squares called *cells*. The row-number (R) and the column-number (C) of a given cell determine its location on the CB. Each cell on the CB has unique values of (R, C) — its *coordinates*, associated with it. For example, in Figure 1 the knight (K) is located in two different cells. The coordinates of the first cell, shaded by diagonal lines, are (6, 3), i.e., it is located in the 6th row and 3rd column; and the coordinates of the second cell, shaded by vertical and horizontal lines, are (1, 8).

In any single move the K travels among the cells of a CB in a L-shaped path, i.e., 1 (or 2) cell(s) in one direction followed by 2 (or 1) cell(s) in a direction perpendicular to the initial direction. If we let (ΔR, ΔC) denote the changes in the coordinates of the K during a move, then the allowed values of ΔR and ΔC are those shown below:



In other words, there are *eight* different values of (ΔR,ΔC), shown in the first two rows of Table I, corresponding to the 8 different possible moves of the K. Given the initial location of the K it is fairly simple to find the new coordinates for all of the 8 different moves. This is demonstrated in the middle two rows of Table I where the initial location of the K is assumed to be (6, 3). The resulting 8 moves are shown in Figure 1 by cells shaded by diagonal lines.

It must, of course, be realized that for certain initial coordinates of the K not all of the 8 moves will be allowed. As an example of this type, consider the K at (1, 8) in Figure 1. The coordinates for 8 possible moves from this initial position are calculated in the last two rows of Table I. Since all values of coordinates less than 1 or larger than 8 will push the K off the CB, the moves 1, 3, 4, 5, 7 and 8 are not allowed when the initial coordinates of the K are (1, 8). The two allowed moves for this starting position are shown by cells shaded with horizontal and vertical lines in Figure 1.

First-Order Moves Associated With a Given Initial Position of the Knight

For each cell on the CB as the start-

Bhairav Joshi, Associate Professor Departments of Chemistry and Computer Science State University College, Geneseo, NY 14454

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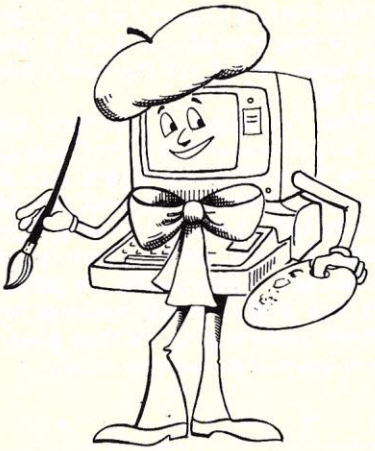

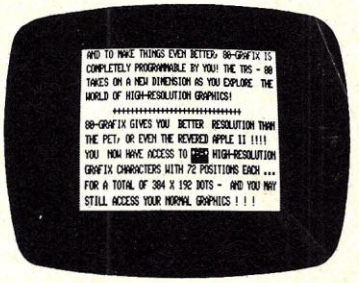
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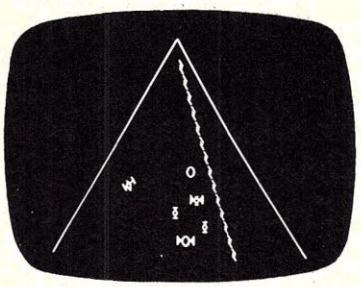

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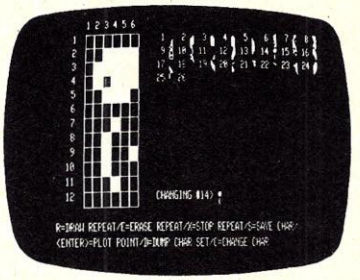

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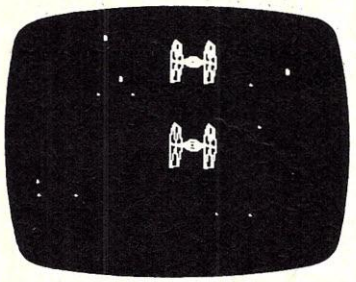

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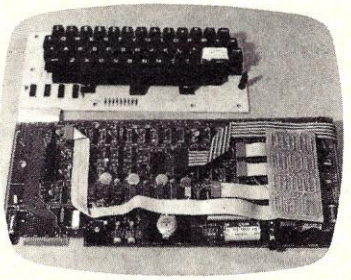

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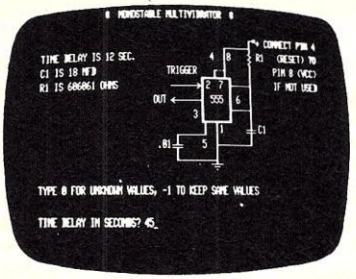
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R1 IS 686861 OHMS
TRIGGER
OUT
555
C1
.01
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TYPE 0 FOR UNKNOWN VALUES, -1 TO KEEP SAME VALUES
TIME DELAY IN SECONDS? 45

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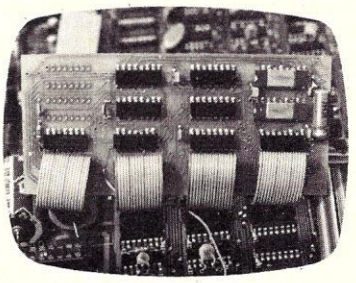

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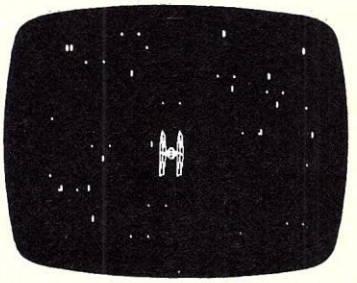

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Problem, cont'd...

ing position of the K, the number of *allowed* moves can be determined using the procedure explained above. These are called the allowed *first order moves* (FOM's). The FOM's for some of the cells of the CB are shown in Figure 2. Note that, as anticipated, the number of FOM's for the cells near the center of the CB is larger than that for the cells near the edge of the CB.

Symmetry of the CB: Before proceeding further it is useful to analyze the symmetry properties of the CB and the ways these properties can be used to simplify various aspects of this problem. The entire CB itself is a big square, labelled as □PQRS in Figure 2, with the following three important symmetry properties:

(1) The cells *above* and *below* the diagonal lines PR (or QS) are equivalent. This is true because a reflection in a vertical plane passing through PR (or QS) simply interchanges the two diagonal halves of the CB without physically altering it in any way.

(2) The cells *above* and *below* the line UV are also equivalent. Here again a reflection in a vertical plane passing through UV simply interchanges the *upper and lower halves* of the CB.

(3) Finally, the cells to the left and the right of the line XY are also equivalent. Here the reflection occurs in a vertical plane passing through the line XY and interchanges the left and the right halves of the CB.

What this means is that there are really only 10 unique cells in the CB, lying (fully or partially) in the shaded area of Figure 2. Each one of the remaining 54 cells of the CB is equivalent to one of these 10 cells. To show this equivalence let $\ominus$ (circle-bar), ϕ (circle-stile), $\oslash$ (circle-slope), and $\varnothing$ (circle-slash) represent the *reflection operations* in vertical planes passing through lines UV, XY, PR, and QS, respectively, of the CB in Figure 2. Thus starting with ΔOPU of Figure 2, the entire square representing the CB can be generated, because a moment's reflection would show that $\ominus(\Delta OUP)$ generates ΔOUS, $\oslash(\Delta OPS)$ generates ΔOPQ, and $\varnothing(\Delta QSP)$ generates ΔQSR. The cells in Figure 2 which are equivalent to one of the shaded cells can be determined in a similar fashion. For example the (1, 1) cell is equivalent to the cells with coordinates (1, 8), (8, 1) and (8, 8) because ϕ(1, 1) gives (1, 8), $\ominus$(1, 1) gives (8, 1), and $\ominus\varnothing$(1, 1) gives (8, 8).

No. of Possible Moves	1	2	3	4	5	6	7	8
ΔR	1	1	-1	-1	2	2	-2	-2
ΔC	2	-2	2	-2	1	-1	1	-1
(8=R) + ΔR	7	7	5	5	8	8	4	4
(8=C) + ΔC	5	1	5	1	4	2	4	2
(1=R) + ΔR	2	2	0	0	3	3	-1	-1
(8=C) + ΔC	10	6	10	6	9	7	9	7

Table I.

A Scheme for Computing the FOM's of the K

	(1,1)	(2,1)	(2,2)	(3,1)	(3,2)	(3,3)	(4,1)	(4,2)	(4,3)	(4,4)
ϕ	(1,8)	(2,8)	(2,7)	(3,8)	(3,7)	(3,6)	(4,8)	(4,7)	(4,6)	(4,5)
$\ominus$	(8,1)	(7,1)	(7,2)	(6,1)	(6,2)	(6,3)	(5,1)	(5,2)	(5,3)	(5,4)
$\ominus\phi$	(8,8)	(7,8)	(7,7)	(6,8)	(6,7)	(6,6)	(5,8)	(5,7)	(5,6)	(5,5)
$\oslash$	-	(1,2)	-	(1,3)	(2,3)	-	(1,4)	(2,4)	(3,4)	-
$\oslash\ominus$	-	(1,7)	-	(1,6)	(2,6)	-	(1,5)	(2,5)	(3,5)	-
$\oslash\phi$	-	(8,2)	-	(8,3)	(7,3)	-	(8,4)	(7,4)	(6,4)	-
$\varnothing=(\oslash\ominus\phi)$	-	(8,7)	-	(8,6)	(7,6)	-	(8,5)	(7,8)	(6,5)	-

Table II.

Each row contains the coordinates of the K obtained by applying the symmetry operation, shown on the left, to the set of coordinates shown in the top row.

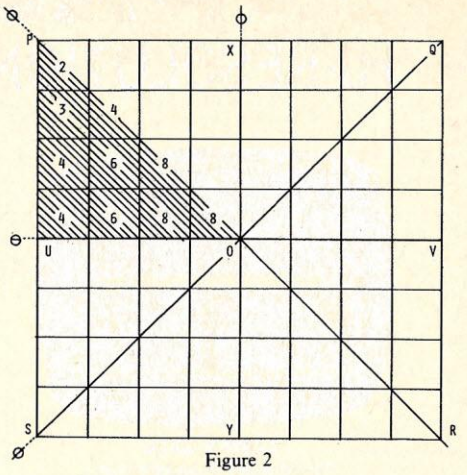

Figure 2

Table II shows how each one of the non-shaded cells of Figure 2 can be obtained from one of the 10 shaded cells. In this Table all of the cells with coordinates occurring in a given column are *equivalent*.

One immediate consequence of the analysis presented in Table II is that the FOM's associated with *any* one of the 64 possible initial positions of the K can now be written down from those given for the 10 unique cells in Figure 2. These are shown in Figure 3.

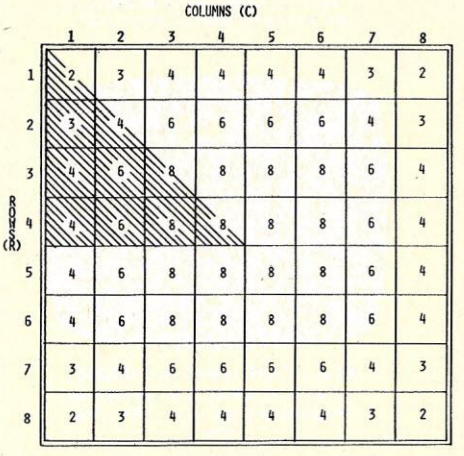

Figure 3

The Second Order Moves (SOM's) and Place-Values (PV's) Associated with a Given Initial Position of the Knight

Having discussed the symmetry properties of the CB and the method of calculating FOM's for the K, it is now a simple task to find the SOM's for the K for each one of the 64 possible starting positions. To find the total number of SOM's for a given starting position, add the FOM's associated with each cell which belongs to a FOM of the K. For example, the SOM's associated with the cell (6, 3) can be calculated as shown in Table III. The information contained in FOM's and SOM's can be conveniently summarized by a decimal number — hereafter referred to as the *place value* (PV). The integer part of PV represents FOM's and the digits

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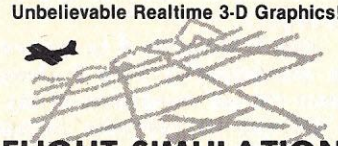

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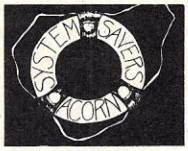

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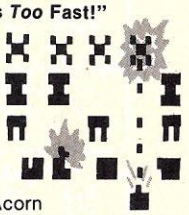

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Initial Coordinates	(6,3)							
Coordinates for allowed FOM's	(7,5)	(7,1)	(5,5)	(5,1)	(8,4)	(8,2)	(4,4)	(4,2)
FOM'S for the new positions (from Figure 3)	6	3	8	4	4	3	8	6
SOM'S	Sum of the above FOM'S = 42							

Table III.

Calculation of *S*econd *O*rder *M*oves (SOM's) for a Given Initial Position of the K

after the decimal point represent SOM's. For example, for the cell (4, 4) there are 8 FOM's and 56 SOM's; the PV associated with this cell is 8.56. The PV's associated with the 10 unique cells of CB are shown in Figure 4.

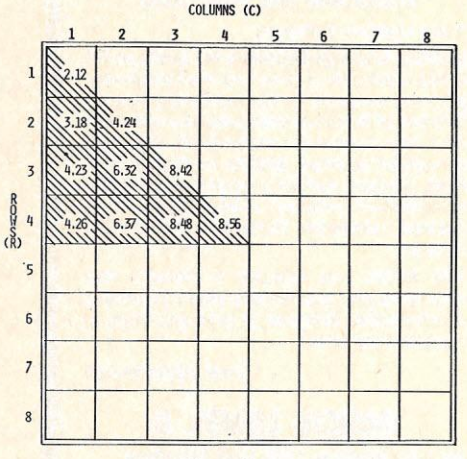

Figure 4

The concept of PV used here is very useful in locating the next move of the K which involves: (1) searching for a cell with *minimum* number of FOM's; (2) if there is more than one cell with the same number of FOM's, then the one with *minimum* number of SOM's is selected. In other words, *given an initial position of the K, the next move of the K will be to the allowed cell with the smallest PV*. If more than one of the allowed cells have the same PV, the choice becomes arbitrary, and can be defined by choosing the cell with the smallest value of the R-coordinate. This arbitrary choice is *not* a restriction for finding a complete itinerary of the K starting from any cell on a CB.

To determine K's itinerary through the CB in the most efficient fashion, starting with *any* initial position, the following procedure can now be used.

Step 1: Initialize an itinerary counter to 1. Create an 8 by 8 matrix, representing the Chess Board. The elements of this matrix, at the beginning, represent the PV's corresponding to each cell of the CB. This matrix can be created by using the data given in Figure 4 and by using the symmetry properties discussed in Section II above.

Step 2: Calculate the new allowed coordinates of the cells of the CB accessible to the K. Find the cell(s) with the lowest PV. If more than one allowed cells with the same PV exist, pick one with the smallest value of the R-coordinate.

Step 3: Decrease the number of FOM's, and hence the PV's, by 1 from all locations of the CB from where the current location will become *unavailable* in all future moves. Note that for the successful determination of the K's itinerary it is *not* necessary to modify the SOM's.

Step 4: Mark the current location of the K on the CB as having already visited. This can be done by replacing the PV in the current location by I×N, where I is itinerary counter (goes from 1 to 64), and N is any number such that (I×N)-8 will be larger than any PV in the matrix CB. Since each time a location becomes unavailable 1 is subtracted from *all* locations to which the given location becomes unavailable, it is necessary that the factor of 8 be kept in mind (since 1 *could* be subtracted 8 times from a given element of CB) while selecting the value of N. In practice N equal to 100 or 1000 is most convenient (see Step 7).

Step 5: Move the K to the new position determined in Step 2 above, i.e., replace the old coordinates of the K on the CB with the new ones. Increase the itinerary counter by 1.

Step 6: Repeat Steps (1) through (5) until the K has completed its tour of the Chess Board, i.e., I becomes greater than 64.

Step 7: Replace the elements of the matrix CB by integers showing the sequential-visit-numbers of the K. At the end of Step 6 the matrix CB will contain PV's *of the order of* (slightly less than) N, 2N, 3N, . . . , 64N showing the cells visited by the K in the order 1, 2, 3, . . . , 64. The PV's in the CB can be replaced by the sequential-visit-numbers by dividing each PV by N and *rounding up* the result to get an integer.

Step 8: Print the resulting matrix of integers from 1 to 64 showing the K's tour.

PROGRAM # 1

```
    ∇ Z←KΔTOUR X;A;B;I;ΔX;Y;□IO
[1]   I←□IO←1
[2]   B←4 4ρ2.12 3.18 4.23 4.26 3.18 4.24 6.32
      6.37 4.23 6.32 8.42 8.48 4.26 6.37 8.48 8.56
[3]   B←,B,[1]⊖B←B,⌽B
[4]   ΔX←Z,[1]⊖-Z←4 2ρ-2 1 2 ¯1 1 2 1 ¯2
[5]  L:Y←(∧/(9>Y)∧Y>0)/Y←ΔX+8 2ρX
[6]  Z←Z,1↓/Z←B[A←¯8++/Y×(ρY)ρ8 1]
[7]   B[A]←B[A]-1
[8]   B[¯8++/X×8 1]←I×100
[9]   X←Y[Z;]
[10]  →L×ι64≥I←I+1
[11]  Z←8 8ρ⌈0.01×B
    ∇
```

PROGRAM # 2

```
    ∇ KΔTOUR1 R
[1]   3 0∇KΔTOUR R
    ∇
```

PROGRAM # 3

```
    ∇ KΔTOUR10;C;R;Z;□IO
[1]   Z←8 0ρR←□IO←1
[2]   L10:C←1
[3]   L20:Z←Z,(3 0∇KΔTOUR R,C),8 2ρ' '
[4]   →L20×ιR≥C←C+1
[5]   →L10×ι4≥R←R+1
[6]   (R↑Z),[1]' ',[1](R↑104⌽Z),[1]' ',[1](R←8 104)↑0 208↑Z
    ∇
```

PROGRAM # 4

```
    ∇ KΔTOURΔALL;B;C;L;R;Z
[1]   R←□IO←1
[2]   B←8 2ρ' '
[3]  L10:C←1
[4]  L20:□←ρL←4×1+R≠C
[5]   0ρ□←'HERE ARE ',(⍕L),' EQUIVALENT ITINERARIES CORRESPONDING
       TO STARTING COORDINATES: ',⍕R,C
[6]   (3 0∇Z),B,(3 0∇⌽Z),B,(3 0∇⊖Z),B,3 0∇⊖⌽Z←KΔTOUR R,C
[7]   →L30×ιL=4
[8]   ' ',[1](3 0∇⍉Z),B,(3 0∇⍉⊖Z),B,(3 0∇⍉⌽Z),B,3 0∇⍉⊖⌽Z
[9]  L30:→L20×ιR≥C←C+1
[10]  →L10×ι4≥R←R+1
    ∇
```

Figure 5

Ten Itineraries of the Knight

As indicated earlier, there are only 10 unique starting positions of the K, and for each one of these a different itinerary can be found by using the above algorithm. All of the remaining 54 itineraries, each with a different starting cell, can be generated from these 10 by the use of symmetry operations presented.

COLUMNS (C)

ROWS (R)	1	2	3	4	5	6	7	8
1	3	36	5	20	57	34	15	18
2	6	21	2	35	16	19	56	33
3	37	4	49	64	51	58	17	14
4	22	7	52	1	48	63	32	55
5	43	38	47	50	59	54	13	28
6	8	23	42	53	46	29	62	31
7	39	44	25	10	41	60	27	12
8	24	9	40	45	26	11	30	61

Figure 6

APL Programs for the Knight's Tours

Four APL programs have been developed to generate the K's tours (see Figure 5). Here is what these programs do:

- K∆TOUR carries out the calculations involved in Steps (1) through (7) described above.
- K∆TOUR1 prints one possible tour of the K for *any* given set of starting coordinates. It is invoked by typing: K∆TOUR1 R,C. Here R and C are the *r*ow and *c*olumn indices of the initial position of the K.
- K∆TOUR10 generates and prints 10 tours — one for each one of the 10 unique starting positions of the K. It is used by simply typing its name.
- K∆TOUR∆ALL generates and prints 64 itineraries of the K corresponding to 64 different starting positions.

Examples

Figure 6 shows a typical tour of the K starting at the cell (4, 4). Notice that the K stops for the last time at the cell (3, 4). Since the K cannot go from cell (3, 4) to cell (4, 4) in one move, such a tour is called a *non re-entrant*. Of the 64 tours generated by my algorithm, 44 of them are non re-entrant tours. An example of a *re-entrant* tour is shown in Figure 7 with a starting position of (4, 3). At the end of this tour the K stops at the cell (5, 5) from where it *can* jump to the starting location in one move. My algorithm generates a total of 20 such tours. Seven of the re-entrant tours are related to the tour (4, 3), seven to the tour (3, 2) and three to the tour (3, 3) by symmetry operations described earlier.

Using the APL program #3 of Figure 5, on an ITEL AS/6 under OS/VS1,

COLUMNS (C)

ROWS (R)	1	2	3	4	5	6	7	8
1	36	3	34	19	38	5	44	21
2	33	18	37	4	43	20	39	6
3	2	35	42	47	40	57	22	45
4	17	32	1	56	49	46	7	58
5	54	13	48	41	64	59	50	23
6	31	16	55	60	51	26	63	8
7	12	53	14	29	10	61	24	27
8	15	30	11	52	25	28	9	62

Figure 7

it takes 4.946 *seconds* to generate 20 tours beginning at 10 unique starting cells of the CB. A. Pauker's Basic program takes 30 *minutes* to do the same job (what computer?); his Fortran program would do it in about 47 seconds. The beauty of my algorithm lies in the fact that it will produce *all* 64 itineraries in about 6 seconds, whereas an algorithm, such as Pauker's, that does not take advantage of the symmetry of the CB would take a very long time (Pauker's Fortran program will take about 300 seconds to generate all 64 tours). □

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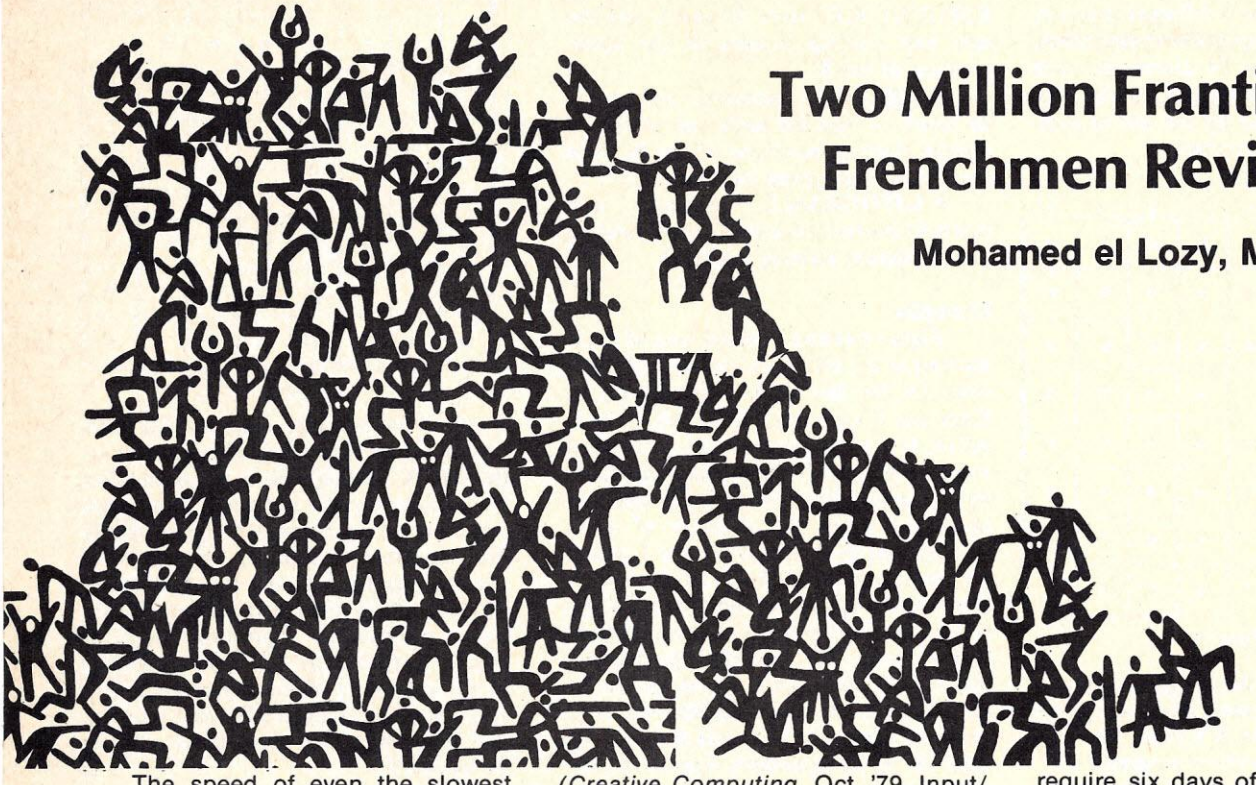

Two Million Frantic Frenchmen Revisited

Mohamed el Lozy, M.D.

The speed of even the slowest computer often allows the use of crude mathematical methods ("brute force" is a term often used) which may be inefficient in terms of computer time but which, by saving human time, may well be efficient in an overall way. Thus, if a computation to be done once can be carried out crudely in one minute, it makes no sense to invest an hour of human time to produce an algorithm that runs in five seconds. On the other hand, there are problems which cannot be solved by brute force and which respond well to brainpower. A good example is the coin-tossing problem recently discussed in this magazine.

N. B. Winkless, Jr. *(Creative Computing,* June '79) has given an entertaining account of what probabilitists call the "Problem of long leads." Briefly, the question posed was: Supposing that the two million residents of Paris all started flipping coins at the rate of one flip per second, and that each stopped as soon as the cumulated totals of heads and tails he had obtained were equal, how many would still be at it (or would "survive") at various levels? Winkless obtained the correct formula, but the method of computation he used breaks down completely if one wants to find the number of "survivors" after a large number of flips. Thus, H. R. Hollander *(Creative Computing,* Oct. '79, Input/Output) calculated that to go to the ten year mark on his computer would require six days of computing, at 24 hours a day! Using a very simple approximation, the number of sur-

Mohamed el Lozy, M.D., Department of Nutrition, Harvard School of Public Health, 665 Huntington Avenue, Boston, MA 02115.

```
1 print "table 1: relative errors of approximations to n!"
2 print
3 print
4 print " n","   n!","rel err 1","  rel err 2"
5 print
6 e=exp(1)
10 f=1
20 for n=1 to 10
30 f=f*n
40 a1=sqr(2*pi*n)*(n/e)^n
50 a2=a1*exp(1/(12*n))
60 e1=abs(f-a1)/f
70 e2=abs(a2-f)/f
80 print n,f,e1,e2
90 next n
100 stop

ready
runnh
```

n	n!	rel err 1	rel err 2
1	1	.077863	2.27427e-03
2	2	.0404979	3.26037e-04
3	6	.0272985	9.96590e-05
4	24	.0205763	4.23590e-05
5	120	.0165072	2.16166e-05
6	720	.0137806	1.24613e-05
7	5040	.0118265	7.75050e-06
8	40320	.0103578	5.03782e-06
9	362880	9.21344e-03	3.10020e-06
10	3.62880e+06	8.29661e-03	1.99791e-06

```
stop at line 100

ready
```

Table 1: Relative errors of approximations to n!

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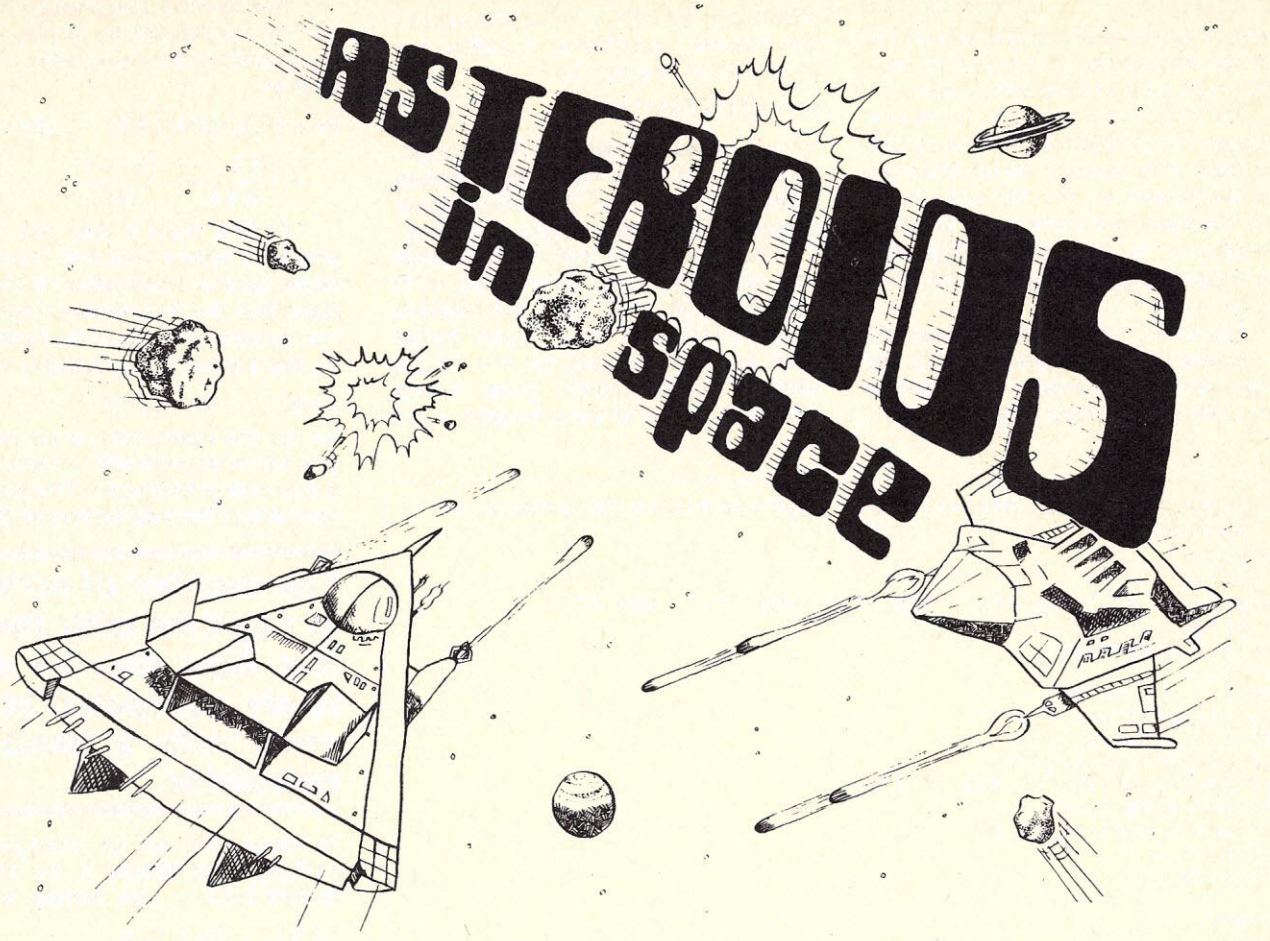

If you liked "Invaders", you'll love ASTEROIDS IN SPACE by Bruce Wallace. Your space ship is traveling in the middle of a shower of asteroids. Blast the asteroids with lasers, but beware — big asteroids fragment into small asteroids! The Apple game paddles allow you to rotate your space ship, fire its laser gun, and give it thrust to propel it through endless space. From time to time you will encounter an alien space ship whose mission is to destroy you, so you'd better destroy it first! High resolution graphics and sound effects add to the arcade-like excitement that this program generates. Runs on any Apple II with at least 32K and one disk drive.
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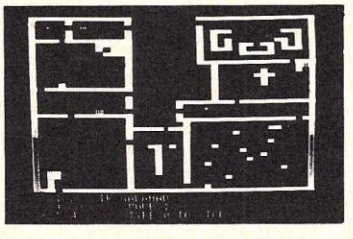

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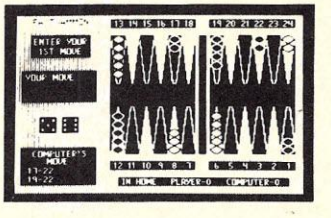

FASTGAMMON™ by Bob Christiansen. Sound, hi res color, and cartoons have helped maked this the most popular backgammon-playing game for the Apple II. But don't let these entertaining features fool you — FASTGAMMON plays serious backgammon. Requires at least 24K of RAM.
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BATTLESHIP COMMANDER™ by Erik Kilk and Matthew Jew. A game of strategy. You and the computer each start out by positioning five ships of different sizes on a ten by ten grid. Then the shooting starts. Place your volleys skillfully — a combination of logic and luck are required to beat the computer. Cartoons show the ships sinking and announce the winner. Sound effects and flashing lights also add to the enjoyment of the game. Requires at least 32K of RAM.
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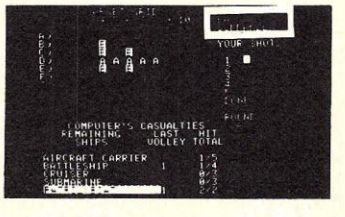

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CIRCLE 178 ON READER SERVICE CARD

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Frenchmen, cont'd...

vivors at any time after the first few flips can be accurately computed in seconds with a hand held calculator.

In this problem, as in many problems in probability, results can be obtained very quickly using Stirling's approximation to the factorial function. As many will remember, factorial n, written n!, is simply the product of all the integers from 1 to n. Thus: $n! = 1.2.3 \ldots (n-1).n$

For small n this is easy to evaluate by repeated multiplication, but for large n it becomes more and more time consuming. Stirling's approximation, in its crudest form, states that, approximately, $n! = \sqrt{2\pi n}\cdot(n/e)^n$

where e (=2.71828 . . . .) is the base of the natural logarithms. A better approximation is given by

$$n! = \sqrt{2\pi n}\cdot(n/e)^n\cdot e^{1/12n}$$

In both cases the ratio of the approximate to the true value approaches unity as n increases. The first program compares these two approximations.

It will be seen that in both cases the relative error decreases with increasing n, and that the second approximation is very much better than the first. Indeed, for n = 10 the second approximation gives results accurate almost to the precision of the arithmetic, while first still has an error of 0.8%.

The method followed by Winkless can be formalized by saying that the probability of surviving after n pairs of flips is

$$P_n = (1/2)\cdot(3/4)\cdot(5/6) \ldots (2n-1)/2n$$

$$= \frac{1\cdot3\cdot5. \ldots . (2n-1)}{2\cdot4\cdot6. \ldots . 2n}$$

At first sight it may not be clear where n! enters into this formula. On more careful observation it should be clear that the denominator consists of the factors of n!, each multiplied by 2, so since there are n factors, we have

$$2\cdot4\cdot6. \ldots . 2n = 2^n.n!$$

As for the numerator, a simple (once you know it!) trick will transform it into a quotient of factorials. The numerator consists of the *odd* factors of (2n)!, and its value will not be changed if we multiply and divide it by the *even* factors 2.4.6. . . . 2n. Hence, we get

$$1\cdot3\cdot5. \ldots . (2n-1) = \frac{(1\cdot3\cdot5. \ldots .(2n-1))\ (2\cdot4\cdot6. \ldots .2n)}{2\cdot4\cdot6. \ldots .2n}$$

The number of survivors at any time after the first few flips can be accurately computed in seconds with a hand-held calculator.

The numerator of this is clearly (2n)!, while we have already seen that the denominator is $2^n.n!$ Hence, we have

$$P_n = \frac{(2n)!}{2^{2n}(n!)^2}$$

a form in which we can readily use Stirling's approximation. Using the simple approximation we get

$$P_n = \frac{1}{\sqrt{n}}$$

while using the more accurate approximation we get

$$P_n = \frac{e^{-1/8n}}{\sqrt{\pi n}}$$

An ever better approximation can be obtained by the use of the gamma function. Those familiar with that function will readily see that

$$P_n = \frac{\Gamma(n+0.5)}{\sqrt{\pi\cdot n!}}$$

Using an excellent approximation given by Raff *(American Statistician,* April 1970, pp 22-24) we get:

$$P_n = \frac{1}{\{(n+0.25)^2 + 1/16\}^{1/4}\sqrt{\pi}}$$

```
1 print "table 2:  comparison of approximations to numbers of
  survivors"
2 print
3 print
4 print " n","  true","  app 1","  app 2","  app 3"
5 print
10 f=2.00000e+06
15 p1=f
20 for n=1 to 30
25 p1=p1*(2*n-1)/(2*n)
30 p2=f/(sqr(pi*n))
35 p3=p2*exp(-1/(8*n))
40 p4=f/((n+.25)^2+.0625)^.25
45 p4=p4/sqr(pi)
50 print n,p1,p2,p3,p4
55 next n
60 stop

ready
runnh
```

n	true	app 1	app 2	app 3
1	1.00000e+06	1.12838e+06	995791	999405
2	750000	797885	749543	749949
3	625000	651470	624883	624989
4	546875	564190	546831	546872
5	492188	504626	492167	492186
6	451172	460659	451161	451171
7	418945	426487	418939	418945
8	392761	398942	392757	392761
9	370941	376126	370939	370941
10	352394	356825	352392	352394
11	336376	340219	336375	336376
12	322360	325735	322360	322361
13	309962	312956	309961	309962
14	298892	301572	298891	298892
15	288929	291346	288928	288929
16	279900	282095	279900	279900
17	271667	273672	271667	271668
18	264121	265962	264121	264121
19	257171	258868	257170	257171
20	250741	252313	250741	250741
21	244771	246233	244771	244771
22	239208	240571	239208	239208
23	234008	235283	234008	234008
24	229133	230329	229133	229133
25	224550	225676	224550	224550
26	220232	221293	220232	220232
27	216154	217157	216154	216154
28	212294	213244	212294	212294
29	208634	209535	208634	208634
30	205156	206013	205156	205156

```
stop at line 60
ready
```

Table 2: Comparison of approximations to numbers of survivors.

The second program compares the performance of three approximations given over the first minute (30 pairs of flips). While approximation 1 does give a rough idea of the true values, it is much less accurate than the other two, with the last one being marginally better than the second.

The third program uses the last approximation to obtain the expected numbers of survivors after selected time periods. This computation confirms the result, obtained by H. R. Hollander by brute force computing, that at the end of one year we should expect to have 284 survivors. It also shows that at the end of one *century* there would be 28 survivors, a result beyond the research of any brute force approach. Finally, we see that after 4 millennia there would still be 4 solitary survivors. □

```
10 print "table 3:  numbers of survivors after"
15 print "          different periods of time"
20 print  \ print
40 u=1
50 for i=1 to 7
60 read l$,f
70 u=u*f \ print l$
100 for j=1 to 4
105 n=j*u
110 p=2.00000e+06/((((n+.25)^2+.0625)^.25)*sqr(pi))
115 p=int(p+.5)
120 print j,p \ next j \ next i
150 stop
160 data "minutes",30
170 data "hours",60
180 data "days",24
190 data "years",365
200 data "decades",10
210 data "centuries",10
220 data "millennia",10

READY
```

```
minutes
 1              205156
 2              145370
 3              118777
 4              102899
hours
 1              26594
 2              18806
 3              15355
 4              13298
days
 1              5429
 2              3839
 3              3134
 4              2714
years
 1              284
 2              201
 3              164
 4              142
decades
 1              90
 2              64
 3              52
 4              45
centuries
 1              28
 2              20
 3              16
 4              14
millennia
 1              9
 2              6
 3              5
 4              4
Stop at line 150
READY
```

Table 3: Numbers of survivors after different periods of time.

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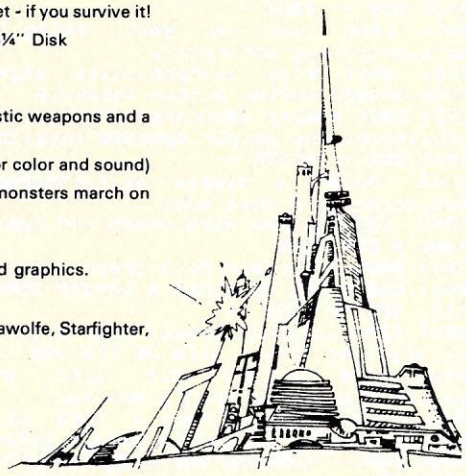

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CIRCLE 102 ON READER SERVICE CARD

A Computerized Identikit for Alien Beings

Ralph Roberts

It ain't easy for a science fiction writer to keep coming up with a bunch of different aliens for each story. Nope, we don't run across all that many in real life, you know. Oh, a few, maybe, but not enough.

So I developed this program to help me and you create our very own aliens. Naturally, space in magazines being limited, this is only a framework. You can add a lot more descriptive phrases to fill up your memory. Or create disk files of the various alien attributes rather than using DATA lines as I have. Also change the paragraph to other settings and so forth. In addition, this program is a great idea generator. It may give you that little spark out of which a story grows.

The program itself is simple. It's written in Smoke Signal Basic for my Chieftain. A few notes of explanation: 'CHR$ (12)' clears my CRT, 'STRING=39' sets the length of string variables, 'P.' is the same as 'PRINT.'

Again, let me stress that this program is just a skeleton. Elaborate. Have fun. Create them aliens, hear? □

Ralph Roberts, P.O. Box 8549, Asheville, NC 28804

Program Listing

```
 0001 PRINT CHR$(12)
 0002 REM ALIEN DESCRIPTION PROGRAM
 0003 REM ::by Ralph Roberts::
 0004 STRING= 39
 0005 LINE= 72
 0010 FOR X=1 TO 10:READ A$(X):NEXT X
 0011 FOR X=1 TO 10:READ B$(X):NEXT X
 0012 FOR X=1 TO 10:READ C$(X):NEXT X
 0013 FOR X=1 TO 10:READ D$(X):NEXT X
 0014 FOR X=1 TO 10:READ E$(X):NEXT X
 0015 FOR X=1 TO 10:READ F$(X):NEXT X
 0016 FOR X=1 TO 10:READ G$(X):NEXT X
 0017 FOR X=1 TO 10:READ H$(X):NEXT X
 0018 FOR X=1 TO 10:READ I$(X):NEXT X
 0050 PRINT "     When I turned the corner in that long corridor
traversing the ";
 0052 PRINT "ancient starship, I found myself face to face with
the alien ";
 0054 PRINT "creature.  I skidded to a halt and nervously looked
it over.  The alien was ";
 0056 PRINT "quite a sight.  Its head was ";:GOSUB 9000:P.A$(A);"
";
 0058 PRINT "and the eyes were ";:GOSUB 9000:P.B$(A);".  ";
 0060  PRINT  "Obviously, its hearing organs were ";:GOSUB
9000:P.C$(A);" ";
 0062  PRINT  "and I found myself repelled by the mouth which was
";
 0064 GOSUB 9000:P.D$(A);".  ";
 0066 PRINT "On the front of that awful face, the nose was
";:GOSUB 9000:P.E$(A);" ";
 0068 PRINT "and I couldn't help noticing that the creature's
body was ";:GOSUB 9000
 0069 PRINT F$(A);".";
 0070  PRINT  "The alien was wearing ";:GOSUB 9000:P.G$(A);"
";"and carrying ";
 0072  GOSUB 9000:P.H$(A);".  Then it spoke with a voice like
";:GOSUB 9000
 0074  PRINT I$(A);".  Only by heroic effort did I regain control
of myself."
 0900 END
 1000 REM -- HEAD --
 1001  DATA  soft and round,kind of squishy,like a block of rusty
steel,bullet-shaped,glowing and pulsing
 1002  DATA  a dark yellow sphere,pitted like an airless
moon,oblong,partially transparent
 1003 DATA like a flattened basketball
 2000 REM -- EYES --
 2001  DATA  three pulsating black circles,like two clusters of
orange grapes,a band of light emitting holes
 2002  DATA  five little rotating balls,constantly blinking blue
lights,like a spider's
 2003  DATA  piercing gray squares,shooting out beams of yellow
heat,unblinking green orbs,two floppy purple stalks
 2500 REM -- EARS --
 2501  DATA  just two small holes,large and floppy like a
dog's,twitching constantly
 2502  DATA  tiny trumphet-like organs,more like tall yellow
horns,always moving purple tendrils
 2503 DATA scaley membranes atop its head,on the tip of its ugly
nose,yellow and purple spotted fans,irregular shaped openings
 3000 REM -- MOUTH --
 3001  DATA  a simple slit,constantly opening and snapping
shut,emitting a foul odor
 3002  DATA filled with sharp red teeth,barely discernable,like a
miser's pursetop
 3003 DATA a perfect dark green square,slobbering drops of purple
drool,hideously open,had a hungry look
 3500 REM -- NOSE --
 3501 DATA flopped forward like a green elephant's,a tiny orange
dot,wiggling with a life of its own
 3502  DATA  jutted out like an orange banana,bobbling
obscenely,pert for such a monster
 3503 DATA seemed to have a life of its own,crinkling at my
smell,unbelievably huge,a single yellow hemisphere
 4000 REM -- GENERAL BODY DESCRIPTION --
 4001 DATA short and squat,massively fat,a great blocklike mass,a
slim sticklikeaffair,like a lake of jello
 4002  DATA sprouting appendages all over,vaguely humaniod,like a
wrinkled gray leather bag
 4003  DATA graced with four legs and an arm,seemingly made up of
small spheres
```

```
 5000 REM -- CLOTHES --
 5001 DATA gaudy plastic coveralls,a very short orange
robe,strings of multicolored beads
 5002 DATA just a wide purple and gold belt,nothing at
all,shimmering strips of greenish light
 5003 DATA something very like Bermuda shorts,leather cowboy
boots and chaps,bits and pieces of odious rags
 5004 DATA a mostly transparent pressure suit
 5500 REM -- WEAPONS AND DEVICES
 5501 DATA a huge broadsword,some sort of raygun,a device
consisting of red lights
 5502 DATA a recording device,a girly magazine,a wicked cutting
instrument
 5503 DATA a much smaller replica of itself,an efficient
appearing lasergun
 5504 DATA a really weird machine,an evil looking throwing weapon
 6000 REM -- SPEECH --
 6001 DATA the roaring of an angry sea,bees buzzing hungrily,a
cold wind whistling
 6002 DATA a buzz saw hitting rusty nails,birds singing offkey,a
stuck doorbuzzer
 6003 DATA rapidly popping champagne corks,fingernails scraping a
blackboard
 6004 DATA the sound of boiling water,the tinkle of shattering
glass
 9000 LET A=INT(RND*10)+1:RETURN
```

Sample Runs

When I turned the corner in that long corridor traversing the ancient starship, I found myself face to face with the alien creature. I skidded to a halt and nervously looked it over. The alien was quite a sight. Its head was partially transparent and the eyes were a band of light emitting holes. Obviously, its hearing organs were yellow and purple spotted fans and I found myself repelled by the mouth which was slobbering drops of purple drool. On the front of that awful face, the nose was flopped forward like a green elephant's and I couldn't help noticing that the creature's body was graced with four legs and an arm.The alien was wearing gaudy plastic coveralls and carrying a wicked cutting instrument. Then it spoke with a voice like rapidly popping champagne corks. Only by heroic effort did I regain control of myself.

When I turned the corner in that long corridor traversing the ancient starship, I found myself face to face with the alien creature. I skidded to a halt and nervously looked it over. The alien was quite a sight. Its head was bullet-shaped and the eyes were unblinking green orbs. Obviously, its hearing organs were tiny trumphet-like organs and I found myself repelled by the mouth which was hideously open. On the front of that awful face, the nose was unbelievably huge and I couldn't help noticing that the creature's body was sprouting appendages all over.The alien was wearing shimmering strips of greenish light and carrying a huge broadsword. Then it spoke with a voice like the roaring of an angry sea. Only by heroic effort did I regain control of myself.

When I turned the corner in that long corridor traversing the ancient starship, I found myself face to face with the alien creature. I skidded to a halt and nervously looked it over. The alien was quite a sight. Its head was kind of squishy and the eyes were like two clusters of orange grapes. Obviously, its hearing organs were more like tall yellow horns and I found myself repelled by the mouth which was filled with sharp red teeth. On the front of that awful face, the nose was jutted out like an orange banana and I couldn't help noticing that the creature's body was like a wrinkled gray leather bag.The alien was wearing nothing at all and carrying an evil looking throwing weapon. Then it spoke with a voice like birds singing offkey. Only by heroic effort did I regain control of myself.

When I turned the corner in that long corridor traversing the ancient starship, I found myself face to face with the alien creature. I skidded to a halt and nervously looked it over. The alien was quite a sight. Its head was bullet-shaped and the eyes were like a spider's. Obviously, its hearing organs were on the tip of its ugly nose and I found myself repelled by the mouth which was constantly opening and snapping shut. On the front of that awful face, the nose was a single yellow hemisphere and I couldn't help noticing that the creature's body was sprouting appendages all over.The alien was wearing bits and pieces of odious rags and carrying an efficient appearing lasergun. Then it spoke with a voice like the roaring of an angry sea. Only by heroic effort did I regain control of myself.

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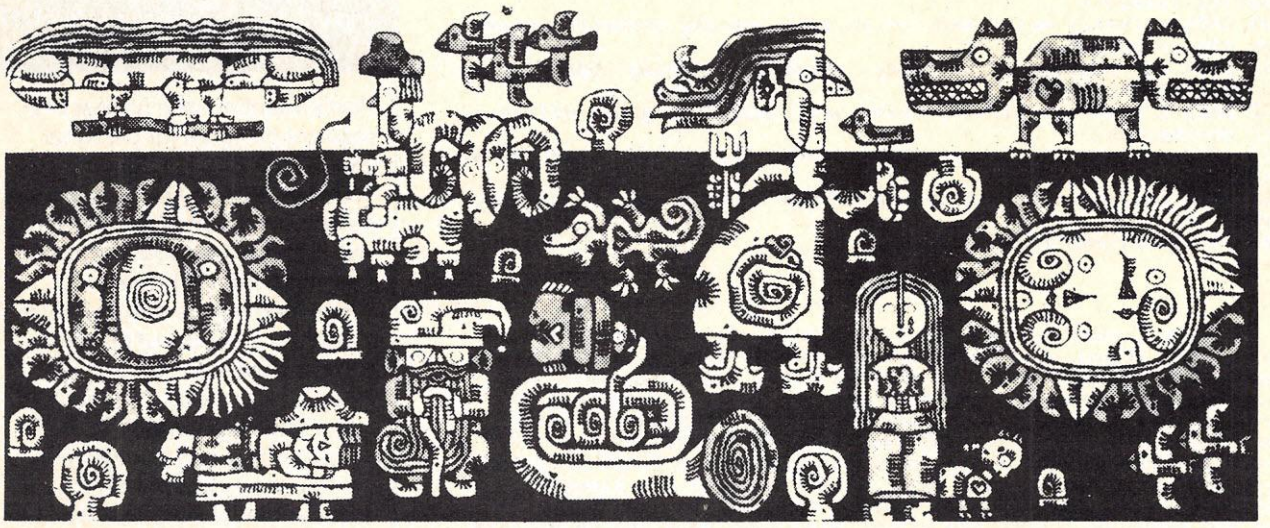
LAP—Will You Accept The Challenge?

Bruce D. Barnett



Here is an exciting game that will not only test your powers of deduction, but will provide you with much entertainment while you try to figure out a hidden pattern on an 8 x 8 grid—if you can—with the least number of queries. The game called LAP, is a thought provoking mixture of BATTLESHIP, MASTERMIND and ZONE-X.

LAP was invented by Lech Pijanowski of Warsaw, Poland and first caught my eye in a book entitled "A GAMUT OF GAMES" by Sid Sackson.

I usually get discouraged if I have to perform an extensive amount of typing to place a game on my home computer.

This article presents a program that enables you to play this challenging game on your computer. I've purposely made the program as short as reasonably possible, since I usually get discouraged if I have to perform an extensive amount of typing to place a game on my home computer, and I've assumed that you might too. Thus this program contains only 20 lines and has no frills. For example, the rules are explained in this article—not in the program—and if you make a mistake, you will simply have to start over. However, this does not present a problem, since the inputs are quite modest anyway. I later mention a number of suggestions and an especially difficult problem should you care to enhance your program.

The rules of LAP are quite simple. Imagine an 8 x 8 square grid divided into four regions marked R1, R2, R3 and R4 such that each region contains exactly 16 cells and each region is continuous. This means that any two squares within a given region can be reached simply by moving horizontally or vertically a square at a time without entering any other region. Figure 1 shows one possible such segmentation. The letters and numbers around the grid serve simply to allow one to name each square.

The object of LAP is to determine the exact location of each of the four regions of a pattern that is hidden from you. As clues, you may ask for the number of cells that are contained within each region for any of four adjacent cells you desire that are in the shape of a square. Thus, referring to Figure 1, if you asked about cells B2, B3, C2 and C3 which obviously form a square, you would recieve the response that three of

Bruce D. Barnett, RD 2, Box 213, Blairstown, NJ 07825

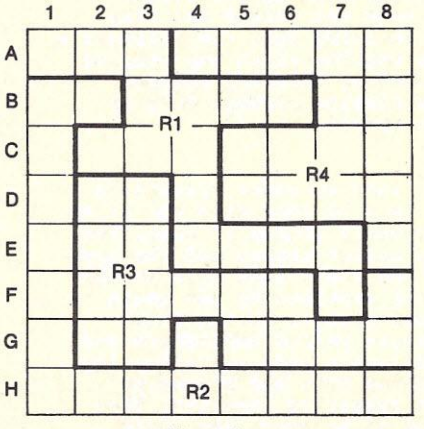


Figure 1

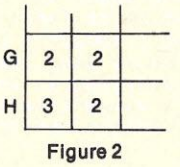


Figure 2

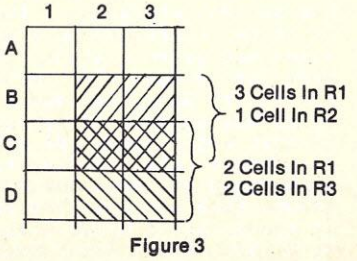


Figure 3

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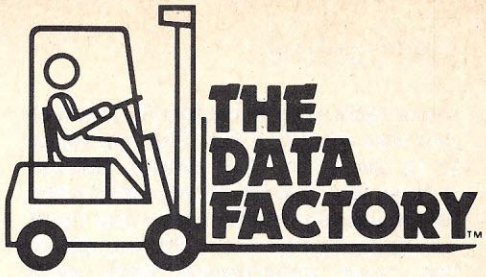

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CIRCLE 156 ON READER SERVICE CARD

LAP, cont'd...

these cells were in region R1 and one cell was in region R2. The challenge is to determine the hidden pattern with as few queries as you need—the fewer you require the better you must be. Thus, not only should you derive the most information from each response, but the queries themselves should be carefully selected.

To get you started, suppose you first asked about G1, G2, H1 and H2, (Query #1 or Q1 for short) and that you received the response that 3 cells were in R2 and that one cell was in R3. Clearly the corner cell must be in R2, for otherwise region R3 could not be continuous as shown in Figure 2. Suppose, further, that a second query (Q2), resulted in 3 cells in R1 and 1 cell in R2 for the square of cells B2, B3, C2 and C3. Similarly, let two cells be in R1 and two cells be in R3 for a third query asking about C2, C3, D2 and D3. See Figure 3. You can immediately deduce that cells C2 and C3 are contained in R1 and D2, D3 are contained in R3. This follows from the fact that the single cell in R2 (from Q2) cannot lie in cells C2 or C3 (referring to Q3), and thus these cells (C2 and C3) are R1 cells since you know from Q2 that three cells lie in R1. A moment's reflection will tell you that D2 and D3 are contained in R3. So far we have the picture of Figure 4, where one of B2 or B3 lies in region R2 with the other cell in region R1. Let Q4 ask about the corner, A1, A2, B1 and B2. Suppose the response was 2 cells in R1 and 2 in R2. Armed with this extra information we can surprisingly arrive at Figure 5. The reasoning is a bit complex—but here goes! Suppose we assume that B3 is in R2. Some reflection shows that A1 must be in R2 and now for the three 2s we've established, (see Figure 6), to be connected the 2s must form a pattern somewhat like Figure 7A or 7B. In either case it is impossible to have 16 continuous cells in all regions. Thus our initial assumption about B3 must be incorrect and thus B3 must be in region R1. A bit more straightforward deduction was applied to finally arrive at Figure 5. This is only a sample of some of the reasoning you can apply to this game, which hopefully has whetted your appetite for more!

In playing this game on your computer, the computer naturally will be the one to respond to your queries. You can make as many queries as you wish by keying in a 1 to the following question that you should see at your terminal when you run the program.

ENTER COORDINATES, (1) OR SEE ANSWER, (2) 1 or 2? In specifying coordinates you need only input the top left cell—the program will figure out the remaining cells that form a square for you. When you think you have the pattern or have simply given up, key in a 2 to the aforementioned question to see the answer. All this is illustrated in the sample run.

The object is to determine the exact location of each of the four regions of a pattern that is hidden from you.

Program Description

This program was written in Northstar Basic. To get started, each square of the grid was individually numbered as shown in Figure 8. Function FNC (Q$) simply converts an inputted cell description such as B5 to the corresponding cell number —13 in this case. Function FNC$(N) is the inverse function and will convert 13 back to B5. You will note that once the top left square is specified such as B5, the four cells that form the larger square of your query always follows the same number pattern. This is illustrated for a specific square in Figure 9A and shown in general in Figure 9B. Statements 80 to 100 calculate and record the region that each of the four cells lie within. The polynomial expression in statement 90, I*(9*I-2*I*I-6), has the property of equalling the 0, 1, 8 and 9 of Figure 9B as I takes on consecutive integers from 0 to 3, and thus identifies the

	1	2	3
A			
B		2?	2?
C		1	1
D		3	3
E			
F			
G			
H	2		

Figure 4

	1	2	3
A	1	1	1
B	2	2	1
C	2	1	1
D	2	3	3
E	2		
F	2		
G	2		
H	2		

Figure 5

	1	2	3
A	2		
B		1	2
C		1	1
D		3	3
E			
F			
G			
H	2		

Figure 6

	1	2	3	4
A	2	1		
B	2	1	2	2
C	2	1	1	2
D	2	3	3	2
E	2			2
F	2	2	2	2
G	2			
H	2			

Figure 7A

	1	2	3	4	5
A	2	2	2		
B	1	1	2	2	2
C		1	1		2
D		3	3		2
E					2
F					2
G					2
H	2	2	2	2	2

Figure 7B

	1	2	3	4	5	6	7	8
A	1	2	3	4	5	6	7	8
B	9	10	11	12	13	14	15	16
C	17	18	19	20	21	22	23	24
D	25	26	27	28	29	30	31	32
E	33	34	35	36	37	38	39	40
F	41	42	43	44	45	46	47	48
G	49	50	51	52	53	54	55	56
H	57	58	59	60	61	62	63	64

Figure 8

four cells that form a square. FNC(Q$) is obviously the number of the top left corner square of your query. The pattern that defines the regions is contained in the variable K$ in statement 20 of which more will be said later. M( ) is the variable that counts the number of cells in each region, M(1) for R1, M(2) for R2 etc. Of course M)) is initialized for the next query after it is printed out in statement 140. Statements 170 to 190 print out the answer.

To change the pattern one need only change statement 20. Five different patterns are provided you at the end of this paragraph for you to try one at a time. However, you need not be limited to just these; a friend can just as easily make up new patterns for you. If you compare Figure 1 with statement 20, you will note that the position of each number corresponds to the cell number and the entry itself is the region that the cell occupies.

```
122222221422444214444142111441423311114231133142333331423333334 2
444111334441113344411133444413332414133324111123222222232222223 3
111144411311424333111243233312432233124322311243222222433444444 4
222222222333332223133224231133342311143411111434144114341144444 4
111111111131222133312421343344213433442134444422334444223332222 2
```

Five Additional Patterns

SQUARE	SQUARE NO.	FORM
B5	13	13 + 0
B6	14	13 + 1
C5	21	13 + 8
C6	22	13 + 9

Figure 9A

SQUARE	SQUARE NO.	FORM
TOP LEFT	X	X + 0
TOP RIGHT		X + 1
BOTTOM LEFT		X + 8
BOTTOM RIGHT		X + 9

Figure 9B

```
10 DIM K$(64),Q$(2)
20K$="1114444422111144211144442331444423311111423333313233233332222222 2"
30 DEF FNC(Q$)=(ASC(Q$(1,1))-65)*8+ASC(Q$(2,2))-48
40 DEF FNC$(N)=CHR$(INT(N-1)/8+65)+CHR$(N-INT((N-1)/8)*8+48)
50 PRINT\INPUT"ENTER COORDINATES, (1),  OR SEE ANSWER, (2)  1 OR 2 ? ",R
51 PRINT
60 ON R GOTO 70,170
70 INPUT"ENTER TOP LEFT COORDINATE ",Q$\PRINT
80 FOR I=0 TO 3
90 N(I)=FNC(Q$)+I*(9*I-2*I*I-6)
100 M(VAL(K$(N(I),N(I))))=M(VAL(K$(N(I),N(I))))+1
110 NEXT I
120 PRINT"POINTS",TAB(14),"REGION",TAB(29),"NO. CELLS IN REGION"
130 FOR I=1 TO 4
140 PRINT FNC$(N(I-1)),TAB(15),I,TAB(30),M(I)\M(I)=0
150 NEXT I
160 GOTO 50
170 FOR J=0 TO 7
180 FOR I=1 TO 8\PRINT TAB(25),K$(8*J+I,8*J+I)," ",\ NEXT I\PRINT
190 NEXT J
```

Listing Of Basic Program

```
READY
RUN

ENTER COORDINATES, (1),  OR SEE ANSWER, (2)  1 OR 2 ? 1

ENTER TOP LEFT COORDINATE A1

POINTS        REGION          NO. CELLS IN REGION
A1              1               2
A2              2               2
B1              3               0
B2              4               0

ENTER COORDINATES, (1),  OR SEE ANSWER, (2)   1 OR 2 ? 1

ENTER TOP LEFT COORDINATE B2

POINTS        REGION          NO. CELLS IN REGION
B2              1               3
B3              2               1
C2              3               0
C3              4               0

ENTER COORDINATES, (1),  OR SEE ANSWER, (2)  1 OR 2 ? 1

ENTER TOP LEFT COORDINATE  C2

POINTS        REGION          NO. CELLS IN REGION
C2              1               2
C3              2               0
D2              3               2
D3              4               0

ENTER COORDINATES, (1),  OR SEE ANSWER, (2)  1 OR 2 ? 2

                        1 1 1 4 4 4 4 4
                        2 2 1 1 1 1 4 4
                        2 1 1 1 4 4 4 4
                        2 3 3 1 4 4 4 4
                        2 3 3 1 1 1 1 4
                        2 3 3 3 3 3 1 3
                        2 3 3 2 3 3 3 3
                        2 2 2 2 2 2 2 2
READY
```

Sample Run

Finally, as promised earlier, some enhancements you may want to add to your program are:

1) Coding that will automatically count the number of cells in each region specified by K$. If they all total up to 16, this will have been a nice check for you.

2) Allow yourself additional tries should you enter an incorrect coordinate.

3) Count and print the number of queries you made before asking for the answer.

4) And now the most challenging of all: have the computer randomly generate the four continuous regions. It should be theoretically possible to generate every possible segmentation by a proper choice of random numbers! Should you accomplish this difficult task you can call yourself a programming genius. □

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Mind Exerciser

Jason Woolf
Charles Hemminger

Have you an agile memory? Are you sober? Try this one on your friends. It's a simple game to measure your powers of recall.

Mind Exerciser displays words at random points on the screen. After a short time you are asked to remember as many of the words as possible.

This program should be adaptable to any Basic which allows positioning of the cursor. This is the version we have worked out for a TRS-80.

The first section of the program initializes everything and reads the words to be used from the DATA statements at the bottom of the program. You can choose up to 199 words up to 12 letters long, but be sure to conclude with "-1".

In Lines 410-520 the cursor positions are chosen. The object is to place them below the title message and so they do not overlap each other or wrap around the screen.

The next seven Lines shuffle the order of the words in the data set. The rest of this simple program is quite straightforward. If you can display upper and lower case then Lines 850-900 can be omitted. The typical TRS-80 enters the ASCII value when an upper-case letter is typed and displays it accordingly. Lower-case entries are taken into the buffer as ASCII lower case but displayed as upper case. This can make for confusing errors by whomever is trying to remember the words. Therefore the program assumes that all DATA is entered with no capitals. This routine can match the stored words with any entries. □

Jason Woolf, Charles Hemminger, 20 North Harrison Ave., Northampton, MA 01060.


```
10  REM MIND EXERCISER
20  REM VERSION 1.0
30  REM BY JASON WOLF & CHARLES HEMMINGER
40  CLS
50  CLEAR2000
60  DIM A$(200),S(200),B$(25),B(25)
70  N=0
80  N=N+1
90  READ A$(N)
100  IF A$(N)="-1" THEN 130
110  S(N)=N
120  GOTO 80
130  N=N-1
140  REM INSTRUCTIONS
150  PRINT @20,"MEMORY EXERCISER"
160  PRINT
170  PRINT "DO YOU NEED INSTRUCTIONS  (YES OR NO)  ";
180  INPUT Q$
190  IF LEFT$(Q$,1)<>"Y" THEN 310
200  PRINT
210  PRINT "     THIS IS AN EXERCISE OF YOUR ABILITY TO CONCENTRATE."
220  PRINT "YOU WILL BE REQUESTED TO CHOOSE THE DENSITY OF WORDS TO"
230  PRINT "BE DISPLAYED ON THE SCREEN.  THEY WILL BE SHOWN FOR A SHORT"
240  PRINT "PERIOD OF TIME WHICH YOU HAVE ALSO CHOSEN.  YOU MUST THEN"
250  PRINT "TRY AND REMEMBER AS MANY AS POSSIBLE."
260  PRINT
270  PRINT "YOU SHOULD TRY AT LEAST 3 EXERCISES TO OBTAIN AN AVERAGE."
280  PRINT
290  PRINT "GOOD LUCK !"
300  PRINT
310  REM SET DENSITY
320  PRINT "DENSITY  (1-5) ";
330  INPUT D
340  D=INT(D)
350  IF D<1 OR D>5 THEN 320
360  D=D*5
```

```
370  PRINT "SPEED  (1-30) ";
380  INPUT S
390  S=INT(S)
400  IF S<1 OR S>30 THEN 370
410  REM RANDOMIZE PRINTING
420  C=0
430  FOR I=1 TO D
440    R=128+RND(883) : REM WANT A NUMBER FROM 128 TO 1023 - 12
450    IF R-INT(R/64)*64>51 THEN 440
460    IF I=1 THEN 500
470    FOR J=1 TO C
480      IF R>B(J)-12 AND R<B(J)+12 THEN 440
490      NEXT J
500    B(I)=R
510    C=C+1
520    NEXT I
530  REM RANDOMIZE DATA WORDS
540  FOR I=N TO 2 STEP -1
550    K=INT(RND(0)*N+1)
560    T=S(I)
570    S(I)=S(K)
580    S(K)=T
590    NEXT I
600  REM DISPLAY TEST
610  CLS
620  PRINT @20,"MEMORY EXERCISER"
630  FOR I=1 TO D
640    PRINT @B(I),A$(S(I))
650    NEXT I
660  REM DELAY
670  FOR I=1 TO S
680    FOR J=1 TO 600
690      NEXT J
700    NEXT I
710  REM ANSWER SHEET
720  C=0
730  CLS
740  FOR I=1 TO D
750    IF I/11<>INT(I/11) THEN 790
760    FOR J=1 TO 600
770      NEXT J
780    CLS
790    PRINT @20,"MEMORY EXERCISER"
800    PRINT @128,"HOW MANY OBJECTS CAN YOU RECALL"
810    M=I-INT(I/11)*11
820    PRINT @256+M*64,"OBJECT # ";I;" ";
830    INPUT T$
840    PRINT @306+M*64,"";
850    REM MAKE SURE NO UPPER CASE CHARACTERS
860    T=LEN(T$)
870    FOR J=1 TO T
880      K=ASC(MID$(T$,J,1)
890      IF K>96 THEN T$=LEFT$(T$,J-1)+CHR$(K-32)+RIGHT$(T$,T-J)
900      NEXT J
910    REM DID HE GET IT RIGHT
920    FOR L=1 TO D
930      IF A$(S(L))<>T$ THEN 1010
940      IF L=1 THEN 1040
950      FOR K=1 TO C
960        IF B$(K)<>T$ THEN 990
970        PRINT "REPEAT"
980        GOTO 1070
990        NEXT K
1000     GOTO 1040
1010     NEXT L
1020   PRINT "SORRY"
1030   GOTO 1070
1040   PRINT "CORRECT"
1050   C=C+1
1060   B$(C)=T$
1070   NEXT I
1080 PRINT "YOU HAD ";C;" OUT OF";D;" CORRECT."
1090 U=U+C
1100 V=V+D
1110 PRINT "WOULD YOU LIKE TO TRY AGAIN  (YES OR NO) ";
1120 INPUT Q$
1130 IF LEFT$(Q$,1)="Y" THEN 420
1140 IF LEFT$(Q$,1)<>"N" THEN 1110
1150 PRINT "YOUR FINAL SCORE WAS";INT(U/V*100);"% CORRECT."
1160 END
1170 REM STORE DATA WORDS OF YOUR CHOSING
1180 DATA DOG,CAT,ELEPHANT,ZEBRA,COW,PIG,SHEEP,DUCK,CHICKEN,RAT
1190 DATA HOUSE,TREE,ROSE,DAFFODIL,BIRD,ROBIN,BLUEJAY,CAR,GARAGE
1200 DATA PICTURE,PENCIL,PEN,PAPER,TYPEWRITER,DIPLOMA,WRENCH,TACK
1210 DATA LIGHT,THIMBLE,SPOOL,WIRE,SNAKE,BUSH,FLOWER,CHAIN
1220 REM LAST DATA WORD MUST BE -1
1230 DATA -1
```


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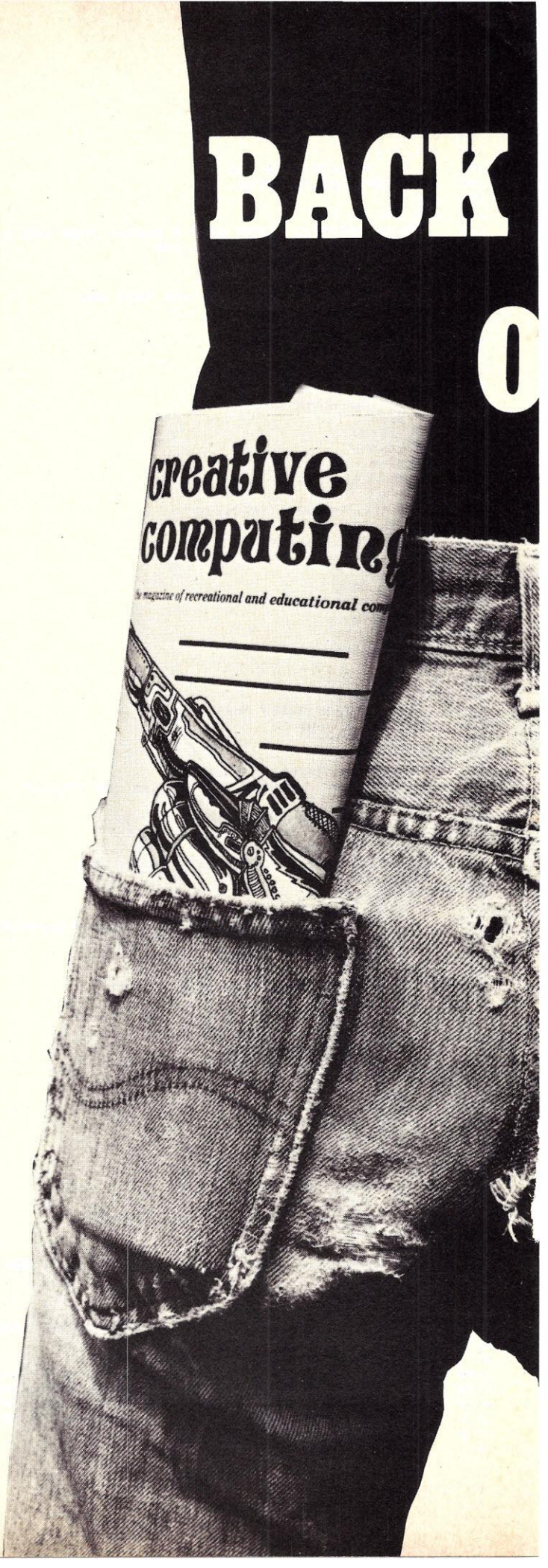

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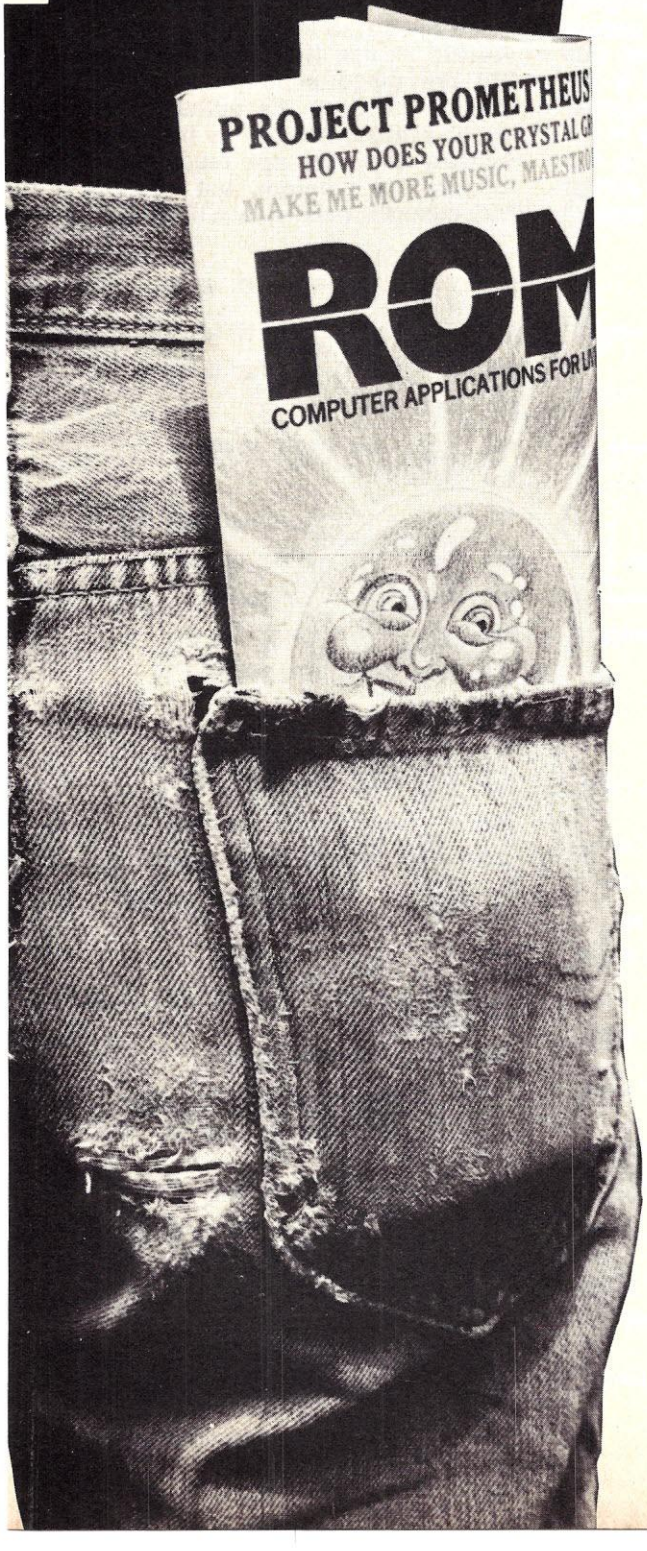

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Six articles on Investment Analysis; David Levy: Intelligent Computer Games; Programs: Geneology, Graphing, Genetics; Evaluations of Word Star vs Electric Pencil; Pascal for the TRS-80; Micro Composer; Data Dubber; Sorcerer Word Processing Pac; Trivia Contest Results.

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7 Features on Saving Money with your Computer: Analysis of Stock Options, Budgeting Model, Shopping Lists, Home Inventory, Home Purchase, Retirement Planning. Computer-Aided Model Rocket Design; Two Natural Language Systems; Evaluations of PET 2022 Line Printer, APF Imagination Machine, Personal Software's Desktop/Plan, Universal Data Entry System.

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14 Graphics Articles: Polar Plots, 3-D Graphics, Animation, Graphic Mazes, Motion Simulation, Inside Space Invaders. 7 Music Articles: Digital Audio, Computer-Aided Sight Reading, Design of a Synthesizer, Digital Enhancement of Old Recordings. Comparison of printers; Evaluations of The Atari Machine, Neelco's Music Box for the PET, HeathKit-Thomas Electronic Organ Kit.

ROM

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What to Name the Baby?

Paul Rayner

I had just finished several hours at my two computers, watching the Apple and the TRS-80 battle out a series of Tic-Tac-Toe games, with pretty much the usual results. The Apple was far superior in play because of its high resolution graphics and color, but the TRS-80 won its games by cheating, using the old keyboard bounce gimmick.

Then I realized that I had really not done any creative computing since my two best-selling programs, "Adventure in the Sin Palace" and "Universe Reversed."

You may recall my version of "Adventure," with its series of 101 erotic rooms, how you experienced the delights of each room, and its varied occupants, before dying of exhaustion with a smile on your face; and "Universe" where the entire solar system is reversed in its orbit, and one must determine the resulting action upon the tides and ocean currents, The Los Angeles Dodgers and the Snail Darters.

Then the brilliant idea came to me—"What to name the Baby?"

The idea evolved into a simple program to find all the possible names for a baby, using four letters, names which would work for boys or girls or whatever.

The idea evolved into a simple program to find all the possible names for a baby, using four letters, names which would work for boys or girls or whatever.

Then, after running, testing, debugging and listing the program, a sudden and frightening realization came upon me. First, I realized that the program was actually producing four-letter words that would not only not be suitable for a child's name but hardly suitable for a truck driver, Marine sergeant or computer programmer — names not normally used in mixed company, and, in fact, used only in current best-selling movies and books. And second, I realized that we were not expecting a child in the near future.

This program, dear reader, is therefore dedicated to you for your use, amusement and modification and/or destruction. The program listing is for Applesoft Basic. It can easily be adapted for other Basics, TRS-80 Level II or merely discarded.

Paul Rayner, 3464 Townhouse Dr., Las Vegas, NV 89121

Explanation Of Listing

Lines 100-250 are preliminary introduction information. Mostly this "dresses up" the listing, but primarily it makes the writer of the program feel quite important. Most people who run programs never see this stuff at all anyhow. Line 250 is the most important line in the program. It contains every element used in the printout and is instrumental to the success of the program. The author fondly refers to this line as a "string" and claims that when properly used this "string" could print out all of William Shakespeare's plays. Lines 260-310 do all the manipulation of the "string" and form the actual printout. The tough part follows... Lines 340-370 do the tricky stuff. Makes each column do its thing, then starts the next column. Line 370 just prints the total number of words. Not necessary, but informative if you quit in the middle of the program you may want to PRINT T and see how close you got to the possible total of 456,976 names (words). Lines 410-680 are gingerbread put into the program because the author found out that magazines pay by the word. Actually they are not required for running the program, but make it look more impressive than it really is. □

```
]LIST

100  HOME
110  VTAB 12: HTAB 12: PRINT "FOU
     R LETTER WORDS": FOR M = 1 TO
     2000: NEXT M
120  HOME : GOTO 400
130  TEXT : HOME : CLEAR
140  REM
150  REM  **********************
160  REM  *                    *
170  REM  * FOUR LETTER WORDS  *
180  REM  *                    *
190  REM  *     PAUL RAYMER    *
200  REM  *      BOX 42831     *
210  REM  * LAS VEGAS NV 89104 *
220  REM  *                    *
230  REM  **********************
240  REM
250  A$ = "ABCDEFGHIJKLMNOPQRSTUVW
     XYZ"
260  W = 1:X = 1:Y = 1:Z = 1
270  T = T + 1
280  W$ =  MID$ (A$,W,1)
290  X$ =  MID$ (A$,X,1)
300  Y$ =  MID$ (A$,Y,1)
310  Z$ =  MID$ (A$,Z,1)
320  PRINT W$;X$;Y$;Z$; CHR$ (32)
     ;
330  W = W + 1
340  IF W > 26 THEN X = X + 1:W =
     1
350  IF X > 26 THEN Y = Y + 1:X =
     1
360  IF Y > 26 THEN Z = Z + 1:Y =
     1
370  IF Z > 26 THEN  PRINT : PRINT
     "TOTAL WORDS: ";T
380  GOTO 270
390  END
400  FOR P = 1 TO 10: PRINT  CHR$
     (7);: NEXT P
410  CALL  - 384
420  VTAB 10: HTAB 16: PRINT " WA
     RNING! "
430  CALL  - 380
440  VTAB 20: PRINT "THIS PROGRAM
      TAKES MORE THAN FIVE HOURS"

450  PRINT "TO COMPLETE!"
460  PRINT : PRINT "ARE YOU UP TO
      IT? (YES/NO)"
470  GET D$
480  IF  LEFT$ (D$,1) = "N" THEN
     670
490  CALL  - 936: CALL  - 384
500  PRINT "
                              "
510  PRINT " SOME OF THESE WORDS
     ARE JUST AWFUL     "
520  PRINT " AND SHOULD NOT BE SE
     EN BY KIDS OR      "
530  PRINT " NICE PEOPLE OR ANYON
     E SINCE THEY ARE   "
540  PRINT " REALLY X-RATED WORDS
     .                  "
550  PRINT "
                        "
560  PRINT " ONE OF THE WORDS IS
     ACTUALLY 'XXXX'!   "
570  PRINT "
                        "
580  PRINT " IF IT GETS TOO DIRTY
      FOR YOU WHILE     "
590  PRINT " THE PROGRAM IS RUNNI
     NG -- JUST PRESS   "
600  PRINT " RESET OR 'CONTROL/C'
      -- OR PULL THE    "
610  PRINT " PLUG OUT OF THE WALL
      SOCKET TO SHUT    "
620  PRINT " OFF THE COMPUTER!
                        "
630  PRINT "
                        "
640  CALL  - 380
650  VTAB 22: PRINT "STILL WISH T
     O CONTINUE? (YES/NO)": GET D
     $
660  IF  LEFT$ (D$,1) = "Y" THEN
      GOTO 130
670  HOME : PRINT "I DON'T BLAME
     YOU!"
680  FOR M = 1 TO 2000: NEXT M: HOME
     : END

]RUN
                FOUR LETTER WORDS
                    WARNING!
THIS PROGRAM TAKES MORE THAN FIVE HOURS
TO COMPLETE!

ARE YOU UP TO IT? (YES/NO)

 SOME OF THESE WORDS ARE JUST AWFUL
 AND SHOULD NOT BE SEEN BY KIDS OR
 NICE PEOPLE OR ANYONE SINCE THEY ARE
 REALLY X-RATED WORDS.

 ONE OF THE WORDS IS ACTUALLY 'XXXX'!

 IF IT GETS TOO DIRTY FOR YOU WHILE
 THE PROGRAM IS RUNNING -- JUST PRESS
 RESET OR 'CONTROL/C' -- OR PULL THE
 PLUG OUT OF THE WALL SOCKET TO SHUT
 OFF THE COMPUTER!

STILL WISH TO CONTINUE? (YES/NO)
AAAA BAAA CAAA DAAA EAAA FAAA GAAA HAAA
IAAA JAAA KAAA LAAA MAAA NAAA OAAA PAAA
QAAA RAAA SAAA TAAA UAAA VAAA WAAA XAAA
```

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Guess My Animal

Mike Orlove

This program plays "Guess My Animal" similar to the program in *Basic Computer Games.* Its internal method of storing questions and answers is somewhat different from the original version. The original stored the questions and possible answers in a linked list simulated with a character string array. This version, by Michael Orlove, stores the information in a tree or program-like form in a string array. The animal-guessing clues are stored as a set of nested IF . . . THEN . . . ELSE structures with the appropriate questions and animal name answers embedded.

At the start of the program run, the computer asks if you are writing the program. If you answer YES, the computer allows you to enter the animal-guessing tree expressed in its simple language. If you answer NO, then it will load a previously saved data tape. Once the game is running, it will recognize a set of commands as given below:

SAVE	Save animal-guessing information on data tape.
READ	Loads in previously saved data tape.
PRINT	Prints out the animal-guessing data tree.
MORE	Continues printing tree after stopping at end of screen.
FINISH	Stops printing tree as an alternate to MORE.
REPLACE	Replaces one string with another throughout the tree.

Note that the tape I/O routines are not implemented in this program but are indicated by remark statements and may be filled in by the user. In entering the program, please enter the words THEN, ELSE, and IF in lines 730, 770, and 810 as *lower case.* On the TRS-80 this must be done by holding down the shift key. The purpose of this subterfuge is to prevent the user from bombing the system by entering an animal named IF, THEN, or ELSE by converting the case. □

Mike Orlove, 2058 Powell Ave., Bronx, NY 10473.

```
ARE YOU WRITING THIS PROGRAM? YES
? IF
? DOES IT FLY?
? THEN
? PIGEON
? ELSE
? PIG
? OK
LET US PLAY 20 QUESTIONS, I GUESS AN ANIMAL AND
  YOU SAY YES OR NO.


DOES IT FLY?
? NO
IT MUST BE A    PIG              RIGHT?
? YES
LET US PLAY 20 QUESTIONS, I GUESS AN ANIMAL
  AND YOU SAY YES OR NO.


DOES IT FLY?
? YES
IT MUST BE A    PIGEON           RIGHT?
? NO
OK I LOSE THIS TIME, WHAT IS THE NAME OF
  YOUR ANIMAL? BEE
WHAT IS THE DIFFERENCE BETWEEN A PIGEON AND
  A BEE? THE BEE HAS SIX LEGS
TYPE IN AN APPROPRIATE QUESTION, WHICH
WHEN ANSWERED YES WILL INDICATE YOU ARE
THINKING OF THE BEE

WHEN YOU ARE FINISHED TYPE OK ON A LINE TO ITSELF.
? IS IT AN INSECT
? (DOES IT HAVE SIX LEGS)?
? OK
LET US PLAY 20 QUESTIONS, I GUESS AN ANIMAL
  AND YOU SAY YES OR NO.


DOES IT FLY?
? PRINT_
  IF
DOES IT FLY?
THEN
  IF
IS IT AN INSECT
(DOES IT HAVE SIX LEGS)?
THEN
BEE
ELSE
PIGEON
ELSE
PIG
OK


? _
```

```
 5 CLS
 9 CLEAR 3000
 10 DIM V$(200)
 12 X7=200
 20 INPUT "ARE YOU WRITING THIS PROGRAM" ;A$
 30 IF A$="NO"THEN 830
 40 V$(1)="THEN":FORI=2TOX7
 50 INPUT V$(I)
 60 IFV$(I)="OK"THEN80
 70 NEXTI
 80 PRINT"LET US PLAY 20 QUESTIONS,
    I GUESS AN ANIMAL AND YOU SAY YES OR NO. "
 90 PRINT:PRINT:PRINT
 100 T3=0:E3=0
 110 I=1
 120 I=I+1
 130 IFV$(I)="IF"THEN170
 140 IFV$(I-1)="THEN"THEN 320
 150 IFV$(I-1)="ELSE"THEN 320
 160 GOTO120
 170 L=I+1:FORI=LTOX7
 180 J=I:IFV$(I) ="THEN"THEN200
 190 PRINTV$(I):NEXTI
 200 INPUTA$:IFA$="YES"THEN120
 201 IF A$="PRINT"THEN 690
 202 IFA$="REPLACE"THEN90A
 203 REM HAVE IF A$=SAVE   REWIND TAPE THEN RECORD
     VECTOR V$
 204 REM HAVE IF V$= LOAD   REWIND TAPE THE READ
     VECTOR V$
 210 IFA$="SAVE"THEN 850
 220 FORI=JTOX7
 230 IFV$(I)="THEN"THEN 250
 240 GOTO270
 250 T3=T3+1
 260 GOTO300
 270 IFV$(I)="ELSE"THEN290
 280 GOTO300
 290 E3=E3+1
 300 IFT3=E3THEN120
 310 NEXTI
 320 PRINT"IT MUST BE A ",V$(I)," RIGHT?"
 330 INPUT A$:IFA$="YES"THEN 80
 340 INPUT"OK I LOSE THIS TIME, WHAT IS THE NAME OF
     YOUR ANIMAL";A$
 350 GOSUB 710
 360 PRINT"WHAT IS THE DIFFERENCE BETWEEN A ";:PRINT
     V$(I);:PRINT" AND A ";:PRINT A$;
 370 INPUT D$
 380 PRINT"TYPE IN AN APPROPRIATE QUESTION, WHICH
     WHEN ANSWERED YES"
 390 PRINT"WILL INDICATE YOU ARE THINKING OF THE ";
     :PRINT A$
 400 PRINT"WHEN YOU ARE FINISHED TYPE OK ON A LINE
     TO ITSELF. "
 420 I$="IF":I9=I
 430 GOSUB620
 440 S$=A$
 449 L=I
 450 L=L+1
 460 INPUT A$
 470 GOSUB710
 480 I$=A$
 490 IFI$="OK"THEN530
 500 I9=L
 510 GOSUB620
 520 GOTO450
 530 L=L-1:I9=L+1
 540 I$="THEN"
 550 GOSUB620
 560 A$=S$
 570 I9=L+2:I$=A$
 580 GOSUB620
 590 I9=L+3:I$="ELSE"
 600 GOSUB620
 610 GOTO80
 620 M=I9-1
 621 M=M+1
 630 IFV$(M)="OK"THEN650
 640 GOTO621
 650 IF M=X7THEN 680
 660 FOR N=M+1TOI9STEP-1:V$(N)=V$(N-1):NEXTN
 670 V$(I9)=I$:RETURN
 680 REM USE TELETYPE
 690 X8=1
 691 FORH=X8TOX8+15:PRINT V$(H):NEXTH
 692 X8=X8+16
 693 INPUTX$
 694 IFX$<>"FINISH"THEN691
 695 GOTO80
 700 REM BACK TO SCREEN
 710 IFA$="THEN"THEN730
 720 GOTO750
 730 A$="THEN"
 740 RETURN
 750 IFA$="ELSE"THEN 770
 760 GOTO790
 770 A$="ELSE"
 780 RETURN
 790 IFA$="IF"THEN810
 800 RETURN
 810 A$="IF"
 820 RETURN
 830 REM READ V$ FROM TAPE
 840 GOTO80
 850 REM BACKSPACE 1
 860 REM SAVE V$ ON TAPE
 870 GOTO80
 900 INPUT A$,B$
 910 I=0
 920 I=I+1
 930 IFV$(I)="OK"THEN 80
 940 IFA$<>V$(I)THEN920
 950 V$(I)=B$
 960 GOTO80
```

Lines 730, 770 and 810: THEN, ELSE and IF should be entered as lower case in the TRS-80 by holding down the shift key while typing them!

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— Carl Galletti and Roger Amidon, owners.

Software with Manual/Manual Alone

All of the software below is available on any of the following media for operation with a Z80 CPU using the CP/M* or similar type disk operating system (such as our own TPM*).

for TRS-80* CP/M (Model I or II)
for 8" CP/M (soft sectored single density)
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BASIC I

A powerful and fast Z80 Basic interpreter with EDIT, RENUMBER, TRACE, PRINT USING, assembly language subroutine CALL, LOADGO for "chaining", COPY to move text, EXCHANGE, KILL, LINE INPUT, error intercept, sequential file handling in both ASCII and binary formats, and much, much more. It runs in a little over 12 K. An excellent choice for games since the precision was limited to 7 digits in order to make it one of the fastest around. $49.95/$15.

BASIC II

Basic I but with 12 digit precision to make its power available to the business world with only a slight sacrifice in speed. Still runs faster than most other Basics (even those with much less precision). $99.95/$15.

BUSINESS BASIC

The most powerful Basic for business applications. It adds to Basic II with random or sequential disk files in either fixed or variable record lengths, simultaneous access to multiple disk files, PRIVACY command to prohibit user access to source code, global editing, added math functions, and disk file maintenance capability without leaving Basic (list, rename, or delete). $179.95/$25.

ZEDIT

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A macro assembler which will generate relocateable or absolute code for the 8080 or Z80 using standard Intel mnemonics plus TDL/Z80 extensions. Functions include 14 conditionals, 16 listing controls, 54 pseudo-ops, 11 arithmetic/logical operations, local and global symbols, chaining files, linking capability with optional linker, and recursive/reiterative macros. This assembler is so powerful you'll think it is doing all the work for you. It actually makes assembly language programming much less of an effort and more creative. $79.95/$20.

MACRO II

Expands upon Macro I's linking capability (which is useful but somewhat limited) thereby being able to take full advantage of the optional Linker. Also a time and date function has been added and the listing capability improved. $99.95/$25.

LINKER

How many times have you written the same subroutine in each new program? Top notch professional programmers compile a library of these subroutines and use a Linker to tie them together at assembly time. Development time is thus drastically reduced and becomes comparable to writing in a high level language but with all the speed of assembly language. So, get the new CDL Linker and start writing programs in a fraction of the time it took before. Linker is compatible with Macro I & II as well as TDL/Xitan assemblers version 2.0 or later. $79.95/$20.

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Many programmers give up on writing in assembly language even though they know their programs would be faster and more powerful. To them assembly language seems difficult to understand and follow, as well as being a nightmare to debug. Well, not with proper tools like Debug I. With Debug I you can easily follow the flow of any Z80 or 8080 program. Trace the program one step at a time or 10 steps or whatever you like. At each step you will be able to see the instruction executed and what it did. If desired, modifications can then be made before continuing. It's all under your control. You can even skip displaying a subroutine call and up to seven breakpoints can be set during execution. Use of Debug I can pay for itself many times over by saving you valuable debugging time. $79.95/$20.

DEBUG II

This is an expanded debugger which has all of the features of Debug I plus many more. You can "trap" (i.e. trace a program until a set of register, flag, and/or memory conditions occur). Also, instructions may be entered and executed immediately. This makes it easy to learn new instructions by examining registers/memory before and after. And a RADIX function allows changing between ASCII, binary, decimal, hex, octal, signed decimal, or split octal. All these features and more add up to give you a very powerful development tool. Both Debug I and II must run on a Z80 but will debug both Z80 and 8080 code. $99.95/$20.

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A Z80 executive and debug monitor. Capable of search, ASCII put and display, read and write to I/O ports, hex math, breakpoint, execute, move, fill, display, read and write in Intel or binary format tape, and more! on disk

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A complete I/O board for S-100 systems. 2 serial ports, 2 parallel ports, 1200/2400 baud cassette tape interface, sockets for 2K of RAM, 3-2708/2716 EPROM's or ROM, jump on reset circuitry. Bare board $49.95/$20.

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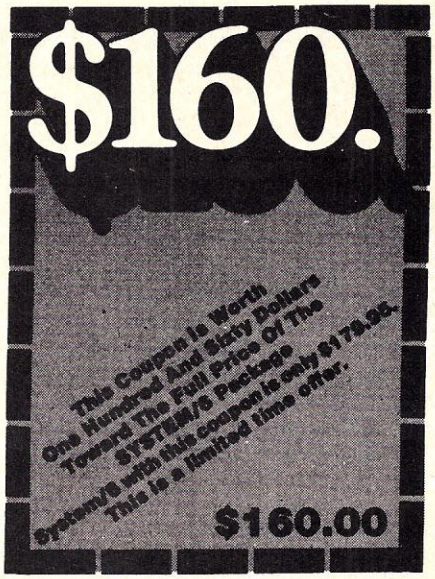
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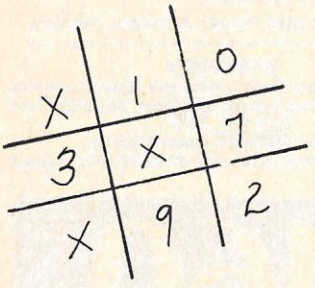

Fifteen and Hot!

Manny Juan

Fifteen and Hot are two games which appeared in Martin Gardner's column in *Scientific American* more than 10 years ago and were described again recently in the games section of *Omni* Magazine. It is surprising that they have not appeared in program form in any of today's personal computing magazines, especially since both share a playing strategy with a very popular pencil and paper game.

The Game of Fifteen

It is a 2-player game where 9 cards (Ace through 9, any suit) are laid face up on the table and the players take turns picking cards from the table. The first player who gets any three cards in his hand that add up to 15 is the winner. The game could also result in a draw. Consider this play:

Move	Player A	Player B
1	4	3
2	5	6 (to block potential 4, 5, 6)
3	2	8 (to block potential 2, 5, 8)
4	9 (wins with 2, 4, 9)	

Note that if player B blocked player A at the third move with a 9 in order to prevent the winner 2-4-9 combination, player A would have countered with 8 at his fourth move to win the game anyway.

If you write the possible combinations of 3 digits which add to 15 you get this list:

$$1 = 5 = 9 = 15$$
$$1 + 6 + 8 = 15$$
$$2 + 4 + 9 = 15$$
$$2 + 5 + 8 = 15$$
$$2 + 6 + 7 = 15$$
$$3 + 4 + 8 = 15$$
$$3 + 5 + 7 = 15$$
$$4 + 5 + 6 = 15$$

Manny Juan, 61 Oakmont Dr., Daly City, CA 94015.

These triads are exactly the number of rows, columns and diagonals in a 3 by 3 magic square whose magic sum is 15, as shown below:

8 1 6
3 5 7
4 9 2

If you replay the game described above on this board putting an 'X' where player A picks a number and an '0' for player B, you will see that it is a disguised game of Tic-Tac-Toe! In this sense, the game of Fifteen is said to be isomorphic (mathematically equivalent) to Tic-Tac-Toe.

The Game of Hot

In this game, the two players alternately cross out words from a list and mark the words they cross with their initials. The winner is the person who has crossed out any three words which share a common letter. The game could also end in a draw. Here is the list of words:

FORM SHIP TANK TIED
HEAR WOES WASP HOT
BRIM

Again this game is a disguised version of Tic-Tac-Toe and this is especially evident if the words are arranged into a "magic square" as shown below:

HOT FORM WOES
TANK HEAR WASP
TIED BRIM SHIP

You will notice that each row, column and diagonal forms a winning combination for this game; which also makes it isomorphic to Tic-Tac-Toe.

The game can also be played in the manner of the game of Fifteen by writing the words on cards and players pick up cards alternately.

For both games then, the player who holds a hidden pattern square has

Sample Run

```
DATE: 79-243; TIME: 12:55:05.4

RUN PGM SOURCE,NOLIST                                    00220000
WHAT GAME DO YOU WANT TO PLAY?
 1=TRADITIONAL TICK-TACK-TOE
 2=GET 3 WORDS WITH A COMMON LETTER TO WIN
 3=PICK 3 NUMBERS WHICH ADD TO 15 TO WIN
 0=QUIT.


GAME  1

123
456
789

      .   X   .
      .   0   .
      .   .   0

YOUR MOVE?


GAME  2

1       2       3       4       5       6       7       8       9
FORM    SHIP    TANK    TIED    HEAR    WOES    WASP    HOT     BRIM
0       .       .       .       .       0       X       .       .

YOUR MOVE


GAME  3

1       2       3       4       5       6       7       8       9
.       .       0       X       .       .       .       0       .

YOUR MOVE


DATE: 79-243; TIME: 12:55:06.1; CPU TIME: 0000.1 SEC
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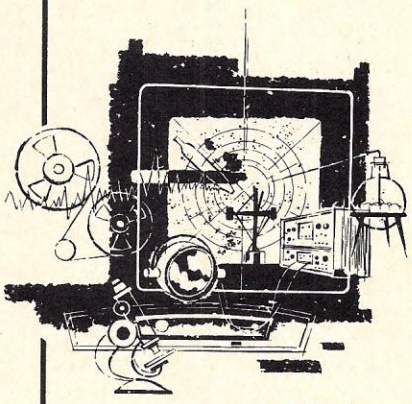
NEW

The Impact of Computers on Society and Ethics: A Bibliography



Where is the computer leading us? Is it a menace or a messish? What are its benefits? What are the risks? What is needed to manage the computer for society's greatest good? Will we become masters or slaves of the evolving computer technology?

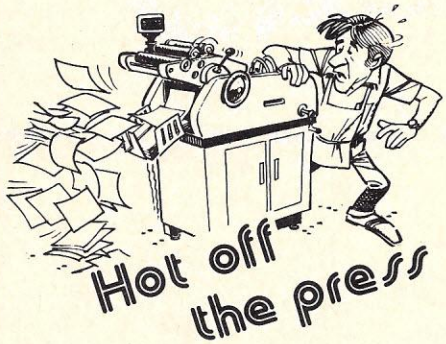
This bibliography was created to help answer questions like these. The works cited can provide the range of facts and opinion necessaary to your understanding of the role of the computer.

This is a bibliography of works dealing with the ways in which computers are being used in our society, the beneficial changes that are taking place in our lives as a result of computer technology, the social and ethical problems intensified by the improper use of computers, the dangers of a computerized society, the safeguards and defences against those dangers, the attempts to indicate what computerized direction the future will take, and the responsibilities of computer professionals. It contains 1920 alphabetical entries of books, magazine articles, news items, scholarly papers and other works dealing with the impact of computers on society and ethics. Covers 1948 through 1979.

Compiled by Gary M. Abshire. Hardbound, 128 pages. $17.95. (12E).

NEW

The Best of creative computing Volume 3



336 pages of articles, activities, fiction, games, programs, reviews, cartoons, and other information from the 1977 issues of Creative Computing. Includes features on technology, public access, educational use, medical applications, and computers in music. Contains great resource listings and reviews of calculators, games, equipment, software and books. There are 96 pages of things to do—puzzles, programs, problems, and games.

A sample of the diverse contents is listed.

Edited by David Ahl and Burchenal Green. Large format. 336 pages. $8.95 (12C).

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Fifteen, cont'd...

the advantage and can always lead the game to a win or a draw by playing Tic-Tac-Toe on this square intelligently and transforming the moves accordingly.

The Program

By utilizing this concept of isomorphism, I have written a program which plays all three games — Tic-Tac-Toe, Fifteen and Hot — by having separate paths in the printing of the playing board and translating the players' moves for each game but sharing the same logic in the playing strategy.

The strategy used by the program can be expressed in these rules:

1. If the computer plays first, it selects a random first move. For succeeding moves, the rules below are applied.

2. If it finds a winning move, it makes it.

3. If it finds a blocking move, it makes it.

4. It picks an empty square with the most number of paths through it (hence, the order of selection is center, corner, then side squares). Where there is more than one possible move to make (for example, four empty corners to choose from), it makes a random selection.

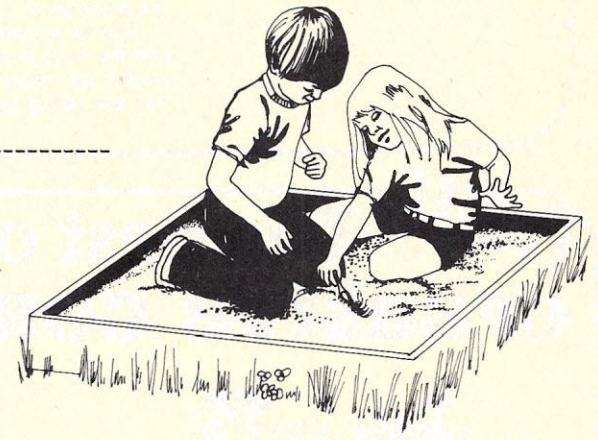
This strategy is not perfect but it is smart enough to lead most games to draw and some to a win. In some games where the human moves first, the computer may lose.

Other Games

Tic-Tac-Toe is not the only game with disguised versions. The popular game of Nim with the winning binary notation strategy can also be played in another form which does not immediately suggest the isomorphism. The usual game of Nim starts with three rows of 3, 4 and 5 stones where the two players alternate to remove one, some or all stones from one row and the winner is the one who takes the last stone. Imagine four 5 by 6 checkerboards stacked one on top of another. A counter (or coin, or chip) placed on the upper right corner of the uppermost level is the starting position of the game. The object of the game is to arrive at the lower left corner of the lowest level by moving the counter in one of three directions which brings it closer to the target corner. In other words, if you are sitting in front of this "playing board," the only moves allowable are to your left, towards you, or down to a lower level. No diagonal moves are permissible.

If you designate the target corner as the origin with coordinates (0,0,0),

```
00010 DIM P(8,3)          REM P CONTAINS WINNING COMBINATIONS
00020 DIM Q(8,3)          REM Q MAPS INTO P;SHOWS OCCUPANCY
00030 DIM S(8)            REM S SUM OF PIECES IN EACH ROW OF Q
00040 DIM T(8)            REM T TOTAL PIECES  IN EACH ROW OF Q
00050 DIM X(9,4)          REM X COORDINATE IN P WHERE MOVE OCCURS
00060 DIM Y(9,4)          REM Y COORDINATE IN P WHERE MOVE OCCURS
00070 DIM Z(9)            REM NUMBER OF PATHS THROUGH A NUMBER IN MAGIC SQ
00080 DIM B(9)            REM PLAYING BOARD
00090 DIM W(9)            REM TRANSLATION TABLE BOARD TO MAGIC SQUARE
00100 DIM V(9)            REM TRANSLATION TABLE MAGIC SQUARE TO BOARD
00110 REM LOAD P WITH WINNING COMBINATIONS
00120 FOR I=1 TO 8
00130 FOR J=1 TO 3
00140 READ P(I,J)
00150 NEXT J
00160 NEXT I
00170 DATA 1,5,9
00180 DATA 1,6,8
00190 DATA 2,4,9
00200 DATA 2,5,8
00210 DATA 2,6,7
00220 DATA 3,4,8
00230 DATA 3,5,7
00240 DATA 4,5,6
00250 REM LOAD W AND V ARRAYS
00260 FOR K=1 TO 9
00270 READ V(K)
00280 LET W(V(K))=K
00290 NEXT K
00300 DATA 8,1,6,3,5,7,4,9,2
00310 REM LOAD X AND Y ARRAYS
00320 FOR I=1 TO 8
00330 FOR J=1 TO 3
00340 LET K=P(I,J)
00350 LET L=Z(K)+1
00360 LET X(K,L)=I
00370 LET Y(K,L)=J
00380 LET Z(K)=L
00390 NEXT J
00400 NEXT I
00410 GOTO 1480
00420 REM UPDATEBOARD(M,D) ----------
00430 LET N=V(M)
00440 IF G=1 THEN 460
00450 LET N=M
00460 FOR L=1 TO Z(N)
00470 LET I=X(N,L)
00480 LET J=Y(N,L)
00490 LET Q(I,J)=D
00500 LET S(I)=S(I)+D
00510 LET T(I)=T(I)+1
00520 LET B(M)=D
00530 NEXT L
00540 REM COUNT MOVES
00550 LET C=C+1
00560 RETURN
00570 REM SHOWBOARD --------------
00580 IF G>1 THEN 790
00590 PRINT'123'
00600 PRINT'456'
00610 PRINT'789'
00620 PRINT
00630 FOR I=1 TO 3
00640 PRINT'       ';
00650 FOR J=1 TO 3
00660 LET E=B(3*(I-1)+J)
00670 IF E=1 THEN 730
00680 IF E<>0 THEN 710
00690 PRINT '.      ';
00700 GOTO 740
00710 PRINT H$;'    ';
00720 GOTO 740
00730 PRINT C$;'    ';
00740 NEXT J
00750 PRINT
00760 NEXT I
00770 PRINT
00780 RETURN
00790 PRINT'1      2      3      4      5      6      7      8      9'
00800 IF G>2 THEN 820
00810 PRINT'FORM    SHIP   TANK   TIED   HEAR   WOES   WASP   HOT    BRIM'
00820 FOR K=1 TO 9
00830 IF B(K)=1 THEN 890
00840 IF B(K)<>0 THEN 870
00850 PRINT'.       ';
00860 GOTO 900
00870 PRINT H$;'       ';
00880 GOTO 900
00890 PRINT C$;'       ';
00900 NEXT K
00910 PRINT
00920 PRINT
00930 RETURN
00940 REM ISITWIN(D) -----------------
00950 LET F=1
00960 FOR I=1 TO 8
00970 REM IF SUM IS +3 OR -3 RETURN F=1 MEANS WIN
00980 IF S(I)=3*D THEN 1010
00990 NEXT I
01000 LET F=0
01010 RETURN
01020 REM FIND NEXT MOVE -----------------
01030 LET I9=0
01040 FOR I=1 TO 8
01050 REM IGNORE IF THERE ARE 3 PIECES IN THE ROW
01060 IF T(I)>2 THEN 1120
01070 REM IF SUM OF ROW IS 2 OR -2, LOOK AT THAT ROW
01080 IF ABS(S(I))<>2 THEN 1120
01090 REM IF SUM IS POSITIVE, MOVE TO WIN ELSE MOVE TO BLOCK
01100 IF S(I)>0 THEN 1160
01110 LET I9=I
01120 NEXT I
01130 REM A ROW OF 2 OR -2 WAS FOUND
01140 IF I9=0 THEN 1250
01150 LET I=I9
01160 FOR J=1 TO 3
01170 LET M=W(P(I,J))
01180 REM SELECT EMPTY SQUARE IN THAT ROW
01190 IF  Q(I,J)=0 THEN 1440
01200 NEXT J
01210 REM SHOULD NEVER HAPPEN
01220 PRINT'ERROR'
01230 STOP
01240 REM AT THIS POINT NO WINNING, BLOCKING MOVE FOUND
```



```
01250 LET K9=0
01260 LET Z9=0
01270 FOR K=1 TO 9
01280 LET B0=B(W(K))
01290 IF G<2 THEN 1320
01300 LET B0=B(K)
01310 REM LOOK AT EMPTY SQUARES ONLY
01320 IF B0<>0 THEN 1410
01330 REM LOOK AT SQUARES WITH MOST PATHS
01340 IF Z9>Z(K) THEN 1410
01350 IF Z9<Z(K) THEN 1390
01360 REM IF EQUAL PATHS SELECT RANDOM
01370 IF INT(10*RND(0)+1)<5 THEN 1410
01380 REM SAVE SELECTED PATH
01390 LET K9=K
01400 LET Z9=Z(K)
01410 NEXT K
01420 REM TRANSLATE MOVE
01430 LET M=W(K9)
01440 IF G<2 THEN 1460
01450 LET M=V(M)
01460 RETURN
01470 REM START ---------
01480 PRINT 'WHAT GAME DO YOU WANT TO PLAY?'
01490 PRINT ' 1=TRADITIONAL TICK-TACK-TOE'
01500 PRINT ' 2=GET 3 WORDS WITH A COMMON LETTER TO WIN'
01510 PRINT ' 3=PICK 3 NUMBERS WHICH ADD TO 15 TO WIN'
01520 PRINT ' 0=QUIT.'
01530 INPUT G
01540 IF G<1 THEN 2270
01550 IF G>3 THEN 1480
01560 PRINT 'WHAT MARKER DO YOU WANT - X OR O?'
01570 INPUT A$
01580 LET H$='X'
01590 LET C$='O'
01600 IF A$='X' THEN 1650
01610 IF A$='O' THEN 1630
01620 GOTO 1480
01630 LET H$='O'
01640 LET C$='X'
01650 GOSUB 570
01660 PRINT'DO YOU WANT TO MOVE FIRST - Y OR N?'
01670 INPUT A$
01680 IF A$='Y' THEN 1920
01690 IF A$<>'N' THEN 1650
01700 REM MAKE ANY MOVE FOR FIRST MOVE
01710 LET M=INT(RND(0)*9+1)
01720 GOTO 1850
01730 REM CHECK IF HUMAN WINS
01740 LET D=-1
01750 GOSUB 950
01760 IF F=0 THEN 1800
01770 PRINT'YOU WIN'
01780 GOTO 2170
01790 REM IS IT A DRAW?
01800 IF C<9 THEN 1840
01810 PRINT'A DRAW'
01820 GOTO 2170
01830 REM LOOK FOR BEST MOVE
01840 GOSUB 1030
01850 REM UPDATE BOARD WITH COMPUTERS MOVE
01860 LET D=1
01870 GOSUB 430
01880 PRINT'MY MOVE IS';M
01890 REM SHOW BOARD
01900 GOSUB 570
01910 REM DID I WIN?
01920 LET D=1
01930 GOSUB 950
01940 IF F=0 THEN 1980
01950 PRINT'I WIN'
01960 GOTO 2170
01970 REM DID MY MOVE RESULT IN A DRAW?
01980 IF C<9 THEN 2010
01990 PRINT'A DRAW'
02000 GOTO 2170
02010 PRINT'YOUR MOVE (ENTER 0 TO SEE BOARD)'
02020 INPUT M
02030 IF M<1 THEN 2050
02040 IF M<10 THEN 2070
02050 GOSUB 570
02060 GOTO 2010
02070 REM
02080 IF B(M)=0 THEN 2120
02090 PRINT'SORRY, THAT PLACE HAS BEEN TAKEN'
02100 GOTO 2010
02110 REM UPDATE BOARD WITH HUMANS MOVE
02120 LET D=-1
02130 GOSUB 430
02140 REM SHOW BOARD
02150 GOSUB 570
02160 GOTO 1740
02170 PRINT'MORE GAMES - Y OR N?'
02180 INPUT A$
02190 REM CLEAR ALL WORK AREAS
02200 MAT Q=(0)
02210 MAT S=(0)
02220 MAT T=(0)
02230 MAT B=(0)
02240 LET C=0
02250 IF A$<>'Y' THEN 1480
02260 GOTO 1650
02270 PRINT'THANKS FOR PLAYING'
02280 STOP
02290 END
```

the starting corner has the coordinates (3,4,5) which corresponds to the starting position of traditional Nim. Any move then reduces one of the coordinates, which is equivalent to removing stones in Nim.

I leave it to the interested reader to write a program which takes advantage of this equivalence. □

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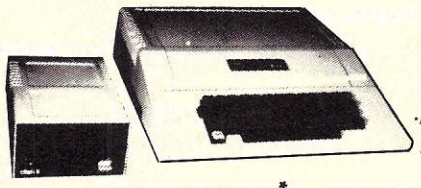

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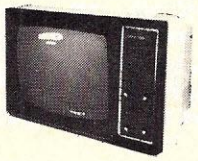

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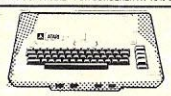

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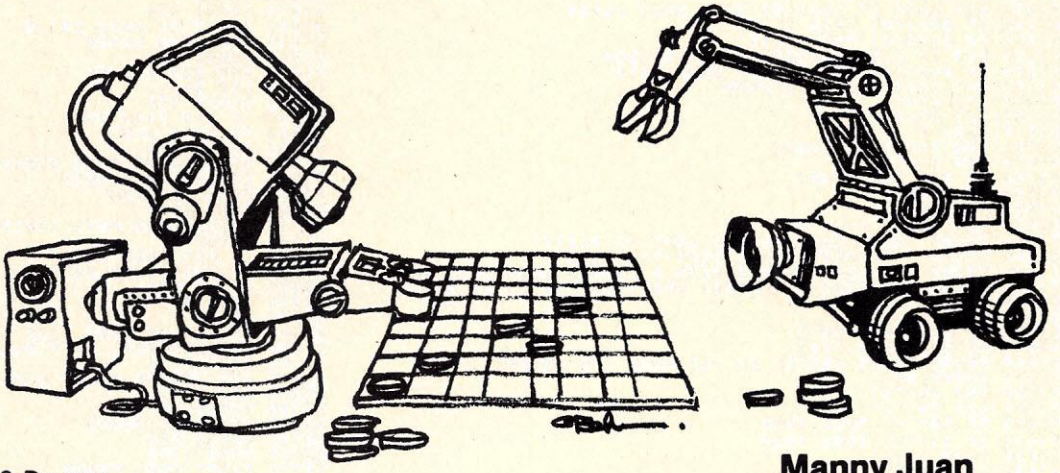


Manny Juan

Are you a master of Nim? Do you know its winning strategy by heart? Do you cancel like powers of 2's by mind? Then this game is for you!

The game of Turnablock combines the flavor of Othello and the winning strategy of Nim. It was described in Martin Gardner's column in the February 1979 issue of *Scientific American* and its winning strategy was later revealed in the following issue. The game described here differs slightly from the one in the article in the way moves are made.

Turnablock is played on a board (in this case, 3 x 3 board) with Othello pieces. Initially the board is filled with the pieces in a checkerboard pattern (ie., alternating black and white). Both players sit on the same side of the board unlike most board games.

Players take turns flipping the pieces bounded by a rectangle within the playing board. The rectangle may be any size (1 x 1, 1 x 2, 1 x 3, 2 x 2, 2 x 3, or 3 x 3) but the left upper corner of the rectangle chosen must contain a black piece. The last player whose move makes the board show all white pieces is the winner.

Refer to the sample game to see how Turnablock is played.

For convenience and for this discussion, the cells of the board are numbered 1 to 9 from left to right and top to bottom as in Figure 1.

The first player can always win with the initial pattern as played in this version. The winning strategy involves the use of a strategy chart that corresponds to the playing board. The cells are weighted as in Figure 2.

Manny Juan, 61 Oakmont Dr., Daly City, CA 94015

1	2	3
4	5	6
7	8	9

Figure 1
Numbering Scheme

1	2	1
2	3	2
1	2	1

Figure 2
Strategy Chart

Program List

```
00010 DIM V(3,3),B(3,3)          REM V FOR WEIGHTS, B FOR BOARD
00020 FOR I=1 TO 3
00030 FOR J=1 TO 3
00040 READ V(I,J)                REM INITIALIZE V(3,3)
00050 NEXT J
00060 NEXT I
00070 DATA 1,2,1,2,3,2,1,2,1
00080 PRINT'WELCOME TO TURNABLOCK!'
00090 LET H=0                    REM HUMAN WINS COUNTER
00100 LET C=0                    REM COMPUTER WINS COUNTER
00110 REM INITIALIZE BOARD
00120 FOR I=1 TO 3
00130 FOR J=1 TO 3
00140 IF V(I,J)=2 THEN 170       REM SKIP EVEN NUMBERED (1-9) CELLS
00150 LET B(I,J)=1               REM PUT BLACK PIECE ON ODD CELLS
00160 GOTO 180
00170 LET B(I,J)=0
00180 NEXT J
00190 NEXT I
00200 GOSUB 670                  REM SHOW BOARD
00210 PRINT'DO YOU WANT TO MOVE FIRST (Y/N). TYPE H FOR HELP'
00220 INPUT A$
00230 IF A$='Y' THEN 420
00240 IF A$='N' THEN 290
00250 IF A$<>'H' THEN 200
00260 GOSUB 1600                  REM PRINT INSTRUCTIONS
00270 GOSUB 1740                  REM MOVE  INSTRUCTIONS
00280 GOTO 200
00290 GOSUB 800                   REM EVALUATE NIM SUM
00300 IF S=0 THEN 330             REM IF NIMSUM NOT ZERO,
00310 GOSUB 1000                  REM FIND WINNING MOVE
00320 GOTO 340
00330 GOSUB 1330                  REM MAKE RANDOM MOVE IF NIMSUM ZERO
00340 PRINT 'MY MOVE IS'; M
```

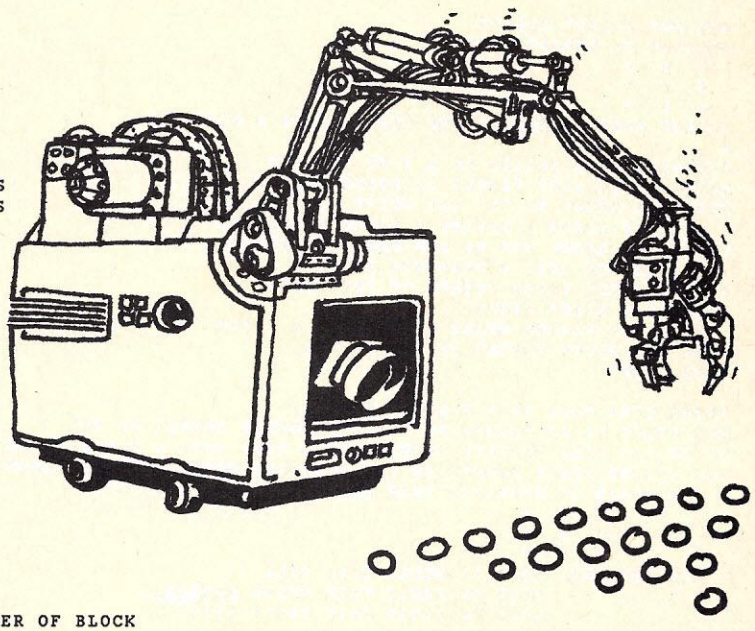
```
00350 GOSUB 1450                REM CONVERT MOVE TO COORDINATES
00360 GOSUB 1530                REM MAKE MOVE
00370 GOSUB 670                 REM SHOW BOARD
00380 IF P<>0 THEN 420
00390 PRINT'I WIN'
00400 LET C=C+1                 REM UPDATE COMPUTERS WIN
00410 GOTO 610
00420 PRINT'YOUR MOVE'
00430 INPUT M
00440 IF M=0 THEN 370
00450 IF M>0 THEN 480
00460 PRINT'YOU LOSE'
00470 GOTO 390
00480 GOSUB 1450                REM CONVERT MOVE NOTATION
00490 IF I9<I1 THEN 520
00500 IF J9<J1 THEN 520
00510 GOTO 550
00520 PRINT'INVALID MOVE'
00530 GOSUB 1740                REM SHOW MOVE INSTRUCTIONS
00540 GOTO 420
00550 IF B(I1,J1)=0 THEN 520    REM CHECK BLACK LEFT UPPER CORNER
00560 GOSUB 1530                REM MAKE MOVE
00570 GOSUB 670                 REM SHOW BOARD
00580 IF P<>0 THEN 290
00590 PRINT'YOU WIN'
00600 LET H=H+1                 REM UPDATE HUMANS WIN
00610 PRINT'ANOTHER GAME (Y/N)'
00620 INPUT A$
00630 IF A$='Y' THEN 110
00640 IF A$<>'N' THEN 610
00650 PRINT'YOU WON ';H;' GAMES. I WON ';C;' GAMES'
00660 STOP
00670 REM SHOW BOARD
00680 LET P=0                   REM NUMBER OF PIECES
00690 FOR I=1 TO 3
00700 FOR J=1 TO 3
00710 IF B(I,J)=1 THEN 740
00720 PRINT'  O';
00730 GOTO 760
00740 LET P=P+1
00750 PRINT'  X';
00760 NEXT J
00770 PRINT
00780 NEXT I
00790 RETURN
00800 REM EVALUATE NIM SUM OF BOARD
00810 LET B1=0                  REM NUMBER OF BINARY ONES
00820 LET B2=0                  REM NUMBER OF BINARY TWOS
00830 FOR I=1 TO 3
00840 FOR J=1 TO 3
00850 IF B(I,J)=0 THEN 960
00860 LET V1=V(I,J)
00870 IF V1=1 THEN 900
00880 IF V1=2 THEN 920
00890 IF V1=3 THEN 940
00900 LET B1=1-B1               REM EXCLUSIVE OR ON B1
00910 GOTO 960
00920 LET B2=1-B2               REM EXCLUSIVE OR ON B2
00930 GOTO 960
00940 LET B1=1-B1
00950 LET B2=1-B2
00960 NEXT J
00970 NEXT I
00980 LET S=B1+B2
00990 RETURN
01000 REM FIND WINNING MOVE
01010 LET M=0                   REM INITIALIZE MOVE
01020 FOR I1=1 TO 3             REM (I1,J1) STARTING CORNER OF BLOCK
01030 FOR J1=1 TO 3
01040 IF B(I1,J1)=0 THEN 1300   REM LOOK FOR BLACK PIECE
01050 FOR I9=I1 TO 3            REM (I9,J9) ENDING CORNER OF BLOCK
01060 FOR J9=J1 TO 3
01070 LET W1=B1                 REM SAVE B1
01080 LET W2=B2                 REM SAVE B2
01090 FOR I=I1 TO I9
01100 FOR J=J1 TO J9
01110 LET V1=V(I,J)
01120 IF V1=1 THEN 1150
01130 IF V1=2 THEN 1170
01140 IF V1=3 THEN 1190
01150 LET W1=1-W1
01160 GOTO 1210
01170 LET W2=1-W2
01180 GOTO 1210
01190 LET W1=1-W1
01200 LET W2=1-W2
01210 NEXT J
01220 NEXT I
01230 LET S=W1+W2
01240 IF S<>0 THEN 1280         REM CHECK FOR WINNING MOVE FOUND
01250 IF M=0 THEN 1270          REM SAVE FIRST MOVE FOUND
01260 IF RND(0)<0.5 THEN 1280 REM TAKE RANDOM CHOICE OF WINNING MOVES
01270 LET M=10*(3*(I1-1)+J1)+(3*(I9-1)+J9)
01280 NEXT J9
01290 NEXT I9
01300 NEXT J1
01310 NEXT I1
01320 RETURN
01330 LET M=0      REM MAKE RANDOM MOVE
01340 FOR I1=1 TO 3
01350 FOR J1=1 TO 3
01360 IF B(I1,J1)=0 THEN 1420
01370 IF M=0 THEN 1390
```

The first player must move so that the values under the black pieces after his move have a "Nim-sum" of zero. To compute the Nim-sum of the board convert the values in the strategy chart corresponding to the black pieces into binary notation and cancel pairs of like powers of 2.

For instance if black pieces occupy cells 5, 6, 8 and 9 in the middle of a game, the respective weights would be 3, 2, 2 and 1 or 1-2, 2, 2 and 1. Cancelling like powers of 2's would leave 2 which is the Nim-sum of the board. The only moves which could turn the Nim-sum to zero would be by flipping the black piece in cell 6 or cell 8.

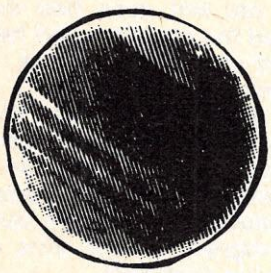
After playing a few rounds of the game you will soon find the symmetry of the strategy chart helpful in determining the move which achieves a zero Nim-sum.

The program computes the Nim-sum before it moves and if the value is zero, it makes a random move. Otherwise, it looks for all safe moves and selects one of them randomly. The program always wins if it is allowed to move first. □



Turnablock, cont'd...

```
01380 IF RND(0)<0.5 THEN 1420
01390 LET I9=I1+INT((3-I1+1)*RND(0))
01400 LET J9=J1+INT((3-J1+1)*RND(0))
01410 LET M=10*(3*(I1-1)+J1)+3*(I9-1)+J9
01420 NEXT J1
01430 NEXT I1
01440 RETURN
01450 REM CONVERT MOVE TO COORDINATE POINTS
01460 LET M1=INT(M/10)
01470 LET I1=INT((M1-1)/3)+1
01480 LET J1=M1-3*(I1-1)
01490 LET M9=M-10*M1
01500 LET I9=INT((M9-1)/3)+1
01510 LET J9=M9-3*(I9-1)
01520 RETURN
01530 REM MAKE MOVE ON BOARD
01540 FOR I=I1 TO I9
01550 FOR J=J1 TO J9
01560 LET B(I,J)=1-B(I,J)      REM FLIP PIECES INSIDE BLOCK
01570 NEXT J
01580 NEXT I
01590 RETURN
01600 REM INSTRUCTIONS
01610 PRINT'TURNABLOCK IS PLAYED ON A 3 BY 3 BOARD'
01620 PRINT'WITH 9 "OTHELLO" PIECES (2-COLOR CHIPS).'
01630 PRINT'BLACK IS SHOWN AS "X" AND WHITE AS "O".'
01640 PRINT'  WE TAKE TURNS FLIPPING A BLOCK OF PIECES'
01650 PRINT'WHERE THE BLOCK MAY BE ANY SIZE RECTANGLE'
01660 PRINT'(1X1 THROUGH 3X3) WITHIN THE BOARD'
01670 PRINT'BUT THE LEFT UPPER CORNER OF THE BLOCK'
01680 PRINT'MUST BE A BLACK PIECE.'
01690 PRINT'  THE LAST PERSON WHOSE MOVE MAKES A BOARD'
01700 PRINT'WITH ALL WHITE PIECES IS THE WINNER.'
01710 PRINT'GOOD LUCK!'
01720 PRINT
01730 RETURN
01740 REM MOVE INSTRUCTIONS
01750 PRINT'ENTER YOUR MOVE AS A 2-DIGIT NUMBER.'
01760 PRINT'THE FIRST DIGIT POINTS TO THE LEFT UPPER CORNER OF THE'
01770 PRINT'BLOCK YOU WISH TO FLIP (THAT SQUARE MUST HAVE A BLACK PIECE)'
01780 PRINT'THE SECOND DIGIT POINTS TO THE OPPOSITE CORNER OF THE BLOCK.'
01790 PRINT'  THE BOARD IS NUMBERED THIS WAY:'
01800 PRINT'           1  2  3'
01810 PRINT'           4  5  6'
01820 PRINT'           7  8  9'
01830 PRINT'  FOR EXAMPLE: MOVE 11 WOULD FLIP CELL 1'
01840 PRINT'               MOVE 46 WOULD FLIP CELLS 456789'
01850 PRINT'               MOVE 26 WOULD FLIP CELLS 2356'
01860 PRINT
01870 PRINT'ENTER 0 TO SEE BOARD AGAIN.'
01880 PRINT'ENTER A NEGATIVE NUMBER TO GIVE UP IN THE MIDDLE OF A GAME.'
01890 PRINT
01900 RETURN
01910 END
```



```
RUN PGM SOURCE,NOLIST
WELCOME TO TURNABLOCK!
  X  O  X
  O  X  O
  X  O  X
DO YOU WANT TO MOVE FIRST (Y/N). TYPE H FOR HELP
H
TURNABLOCK IS PLAYED ON A 3 BY 3 BOARD
WITH 9 "OTHELLO" PIECES (2-COLOR CHIPS).
BLACK IS SHOWN AS "X" AND WHITE AS "O".
  WE TAKE TURNS FLIPPING A BLOCK OF PIECES
WHERE THE BLOCK MAY BE ANY SIZE RECTANGLE
(1X1 THROUGH 3X3) WITHIN THE BOARD
BUT THE LEFT UPPER CORNER OF THE BLOCK
MUST BE A BLACK PIECE.
  THE LAST PERSON WHOSE MOVE MAKES A BOARD
WITH ALL WHITE PIECES IS THE WINNER.
GOOD LUCK!

ENTER YOUR MOVE AS A 2-DIGIT NUMBER.
THE FIRST DIGIT POINTS TO THE LEFT UPPER CORNER OF THE
BLOCK YOU WISH TO FLIP (THAT SQUARE MUST HAVE A BLACK PIECE)
THE SECOND DIGIT POINTS TO THE OPPOSITE CORNER OF THE BLOCK.
  THE BOARD IS NUMBERED THIS WAY:
          1  2  3
          4  5  6
          7  8  9
  FOR EXAMPLE: MOVE 11 WOULD FLIP CELL 1
               MOVE 46 WOULD FLIP CELLS 456789
               MOVE 26 WOULD FLIP CELLS 2356

ENTER 0 TO SEE BOARD AGAIN.
ENTER A NEGATIVE NUMBER TO GIVE UP IN THE MIDDLE OF A GAME.

  X  O  X
  O  X  O
  X  O  X
DO YOU WANT TO MOVE FIRST (Y/N). TYPE H FOR HELP
N
MY MOVE IS 36
  X  O  O
  O  X  X
  X  O  X
YOUR MOVE
 66
  X  O  O
  O  X  O
  X  O  X
MY MOVE IS 59
  X  O  O
  O  O  X
  X  X  O
YOUR MOVE
 89
  X  O  O
  O  O  X
  X  O  X
MY MOVE IS 78
  X  O  O
  O  O  X
  O  X  X
YOUR MOVE
 66
  X  O  O
  O  O  O
  O  X  X
MY MOVE IS 13
  O  X  X
  O  O  O
  O  X  X
YOUR MOVE
 99
  O  X  X
  O  O  O
  O  X  O
MY MOVE IS 33
  O  X  O
  O  O  O
  O  X  O
YOUR MOVE
 89
  O  X  O
  O  O  O
  O  O  X
MY MOVE IS 28
  O  O  O
  O  X  O
  O  X  X
YOUR MOVE
 99
  O  O  O
  O  X  O
  O  X  O
MY MOVE IS 58
  O  O  O
  O  O  O
  O  O  O
I WIN
ANOTHER GAME (Y/N)
N
YOU WON  0     GAMES. I WON  1     GAMES
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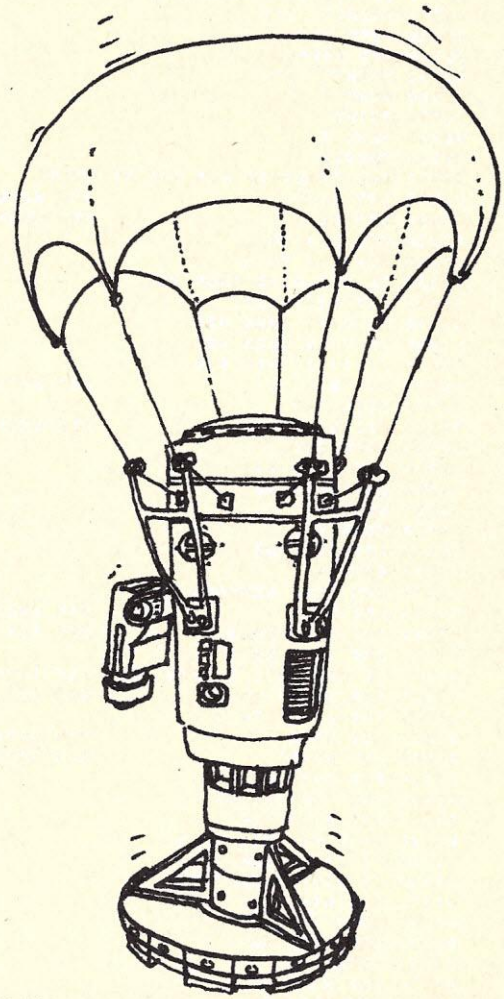

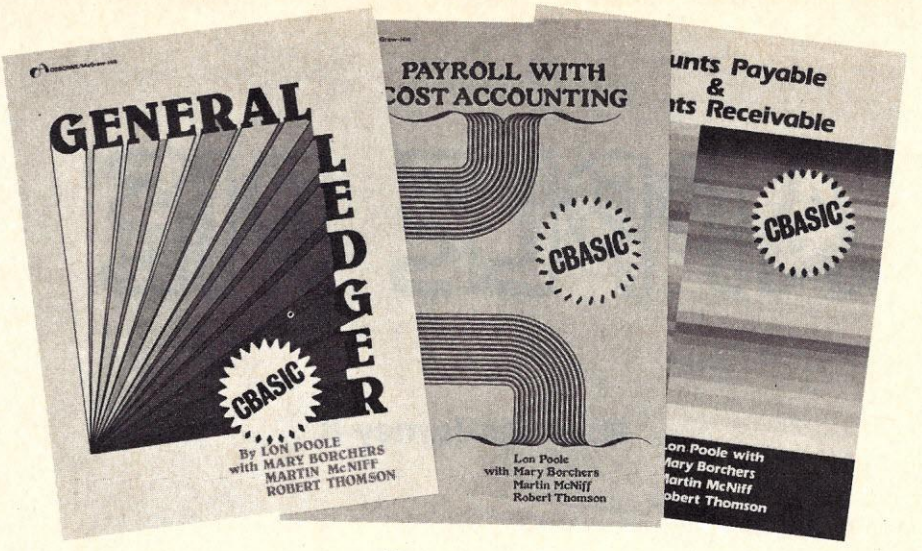

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3. Displays of data relationships that must be quickly and easily grasped by potentially unsophisticated audiences.
4. Illustrations where relative amounts are to be emphasized, as opposed to data trends.

Pie charts also have the distinct advantage of being much easier to program than grid-based routines (while the accompanying listing may look intimidating at first glance, the bulk of it is comment statements — for which I have no apologies). The key to pie charts is in the use of the trigonometric functions SIN and COS coupled with a little polar and cartesian geometry. In polar geometry a circle centered at the polar coordinate system origin is achieved by holding the radius (r) constant and varying the angle through 360 degrees (i.e., r=c). To convert to the cartesian coordinate system, that we need to use the Apple's HIRES screen:

$x = r \cos \theta$

$y = r \sin \theta$

N. R. McBurney II, 2561 Stockbridge Rd., Marietta, GA 30062.

Finally, by adding constants to x and y we can move the center of the circle to any valid coordinates on the HIRES screen. This is exactly what happens in lines 1700-1780 and 1860. In fact, once the requisite variables are initialized the instructions in lines 1700-1780 and 1860 are all that are required to generate the pie chart. The rest of the program is concerned with input, labeling, error detection and general beautification of the display.

The program allows up to ten input values to be specified along with two title lines of up to forty characters each. The titles are entered in the DATA statements in lines 2690 and 2700. Titles will be automatically centered by the program. The title lines are followed by up to ten more DATA statements (lines 2720-2760 in the accompanying listing) contain three fields each. The first field is the amount the sector is to represent. The second field is a short description of the sector that will be used to label the graph. The third and final field is the color for the sector. Colors will vary depending on your TV display and how it is adjusted. On my set the following values for the color field results in the associated sector color:

1 = Green
2 = Blue
3 = White
4 = Black
5 = Orange

You will want to experiment with the color field. I've found that some color combinations give strange results when drawn next to each other (e.g., orange next to green). My local

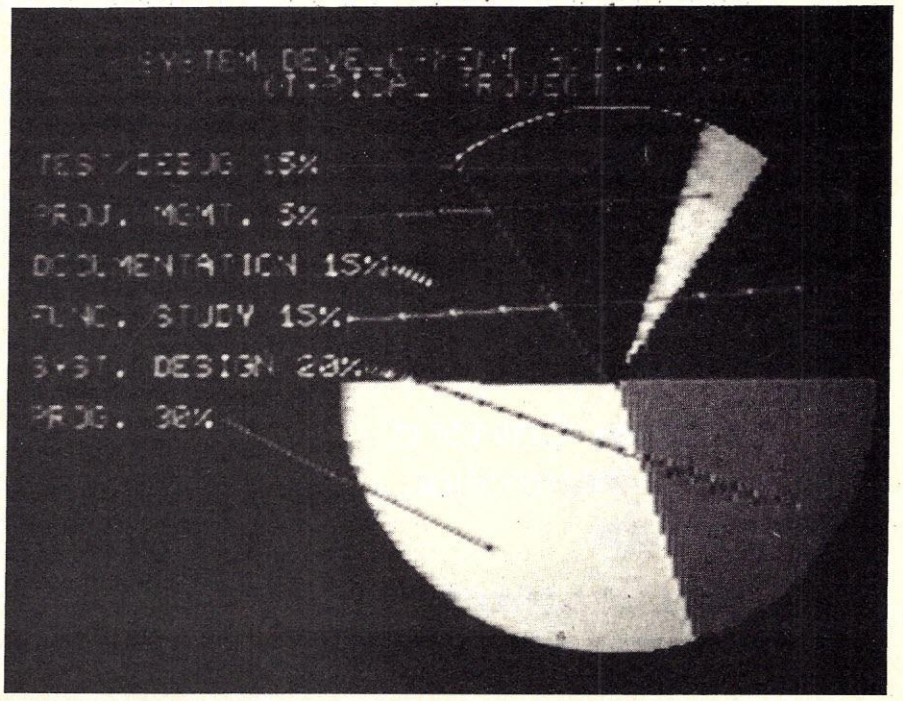

FIGURE 1

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SIDE ONE 33⅓ RPM ALF 13-1-2 STEREO
1. GOING OUT OF MY HEAD (AT THE HOME ORGAN)
RANDAZZO & WEINSTEIN — SILVERIA 3:13
2. CHAMPAGNE TANGO AROZTEGUI — TUBB 1:21
3. DIXIE BOOGIE EMMET, ZEPP — SILVERIA 1:30
4. MARCH OF THE WOMP RATS BLOOM 1:10
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Pie, cont'd...

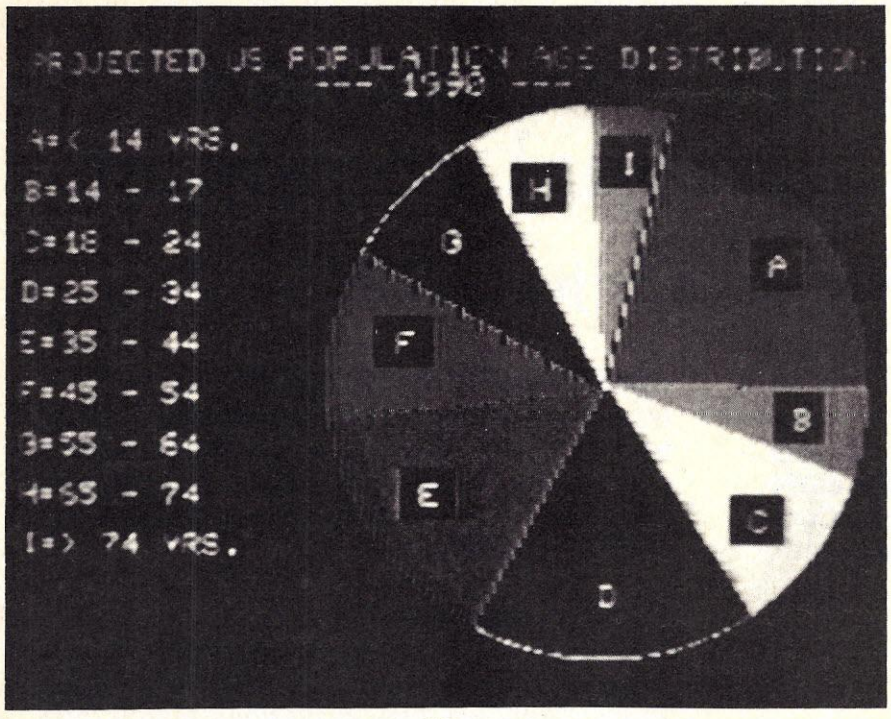


FIGURE 2

computer shop explained it away as 'color flip' but I wasn't about to show my ignorance and ask what that was.

The DATA statement at line number 2680 specifies rotation and labeling mode. The first field will rotate the pie chart in a clockwise (or counterclockwise if negative) direction. The second field specifies the labeling mode. If the second field equals one then the labels are printed to the left of the display with a line drawn to each corresponding sector. The program attempts to order the display of the labels such that none of these lines will cross. This is done in lines 2060-2170. The program is not always completely successful at this, but by rotating the graph (field-1) and adjusting the length of the sector labels, crossed lines can be avoided. The display shown in Figure 1 was generated by the data statements in the attached listing and uses this mode of labeling.

If the second field of the first DATA statement is two, then each sector is labeled with a character from A to J, and the same character plus a '=' is prepended to the label when it is displayed. This mode of labeling is illustrated in the display shown in Figure 2. Figure 2 was generated with the following DATA statements:

```
DATA 15,2
DATA PROJECTED US POPULA-
     TION AGE DISTRIBUTION
DATA ———1990———
DATA 52005,< 14 YRS.,1
DATA 12771,14 - 17,2
DATA 25148,18 - 24,3
DATA 41086,25 - 34,4
DATA 36592,35 - 44,5
DATA 25311,45 - 54,1
DATA 20776,55 - 64,4
DATA 17804,65 - 74,3
DATA 12021,> 74 YRS.,2
```

The program was written in ROM Applesoft on a 48K RAM system but should run on a smaller system.

Labeling is done with the High Resolution Character Generator and Table by Christopher Espinosa in the ***Apple Software Bank Contributed Volumes 3-5.*** This software has the distinct advantage of price — it's free from your local Apple dealer! You just provide the blank disk or cassette (the manual did cost me $2.00). These software routines are read into RAM from disk by the statements in lines 1870-1940. If you are using a cassette simply load the character generator at $6000 and the character table at $6800 or wherever you have room. There are limitations on the starting addresses of this software so be sure to check Apple's documentation (mentioned above) before rearranging things. Once the routines are loaded, delete lines 1870-1940 and run the program.

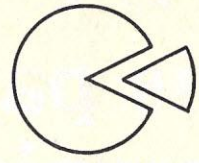
Other than the above comments, the program is fairly simple and the liberal comments should prove adequate to walk your way through the program.

Some enhancements the reader may want to consider are:

1. Displaying the percent in each sector.

2. Writing logic so that lines from labels to sectors would only be drawn for sectors too small to label with a character key.

3. Detaching a specified sector to highlight it (as below):



4. Automatic sector color assignment (i.e., work out what color combinations work).

5. Draw the pie as a coin seen from an oblique angle.

6. Forget the whole color thing and do it in black and white with lines instead of shading.

7. Modify the input section to select graph data from disk, cassette or enter interactively.

While you're considering all this I'll go get a piece of pie — Apple pie at that! □

```
1000 REM   +-----------------------------------------------+
1010 REM   :              PIE CHART GENERATOR              :
1020 REM   :                      BY                       :
1030 REM   :                 W.R. MCBURNEY                 :
1040 REM   :                  FEBUARY 1980                 :
1050 REM   +-----------------------------------------------+
1060 REM   : DATA FORMAT:                                   :
1070 REM   :  LINE# DATA ANGLE,LABEL MODE                   :
1080 REM   :     WHERE:                                     :
1090 REM   :        ANGLE=ANGLE OF ROTATION                 :
1100 REM   :              (DEGREES CLOCKWISE)               :
1110 REM   :        LABEL MODE=1, DRAW POINTER TO           :
1120 REM   :                  EACH SECTION                  :
1130 REM   :                =2, LETTER CODE                 :
1140 REM   :                  EACH SECTION                  :
1150 REM   :  LINE# DATA FIRST LINE OF TITLE                :
1160 REM   :  LINE# DATA SECOND LINE OF TITLE               :
1170 REM   :  LINE# DATA VALUE,LABEL,COLOR                  :
1180 REM   :     WHERE:                                     :
1190 REM   :        VALUE=PORTION OF TOTAL FOR PIE SECTOR   :
1200 REM   :        LABEL=SECTOR LABEL                      :
1210 REM   :        COLOR=SECTOR COLOR (1-5)                :
1220 REM   +-----------------------------------------------+
1230 R = 87:PI = 3.141593 * 2:X1 = 279 - R:Y1 = 192 - R
1240 REM   +--------------------------------+
1250 REM   : READ IN ANGLE AND LABELING MODE :
1260 REM   +--------------------------------+
1270 READ GAMMA,MODE
1280 IF MODE = 1 OR MODE = 2 THEN 1310
1290 PRINT "ERROR-LABELING MODE MUST BE 1 OR 2"
1300 STOP
1310 GAMMA = PI / 4 - GAMMA / 360 * PI
1320 DIM Z(10),LABEL$(10),C(10)
1330 DIM X2(10),Y2(10)
1340 DIM A(10),TITLE$(2)
1350 REM   +--------------------+
1360 REM   : READ IN THE TITLES :
1370 REM   +--------------------+
1380 FOR I = 1 TO 2
1390 READ TITLE$(I)
1400 TITLE$(I) =  LEFT$ (TITLE$(I),40)
1410 NEXT I
1420 REM   +------------------------+
1430 REM   : INPUT PIE CHART DATA :
1440 REM   +------------------------+
1450 ONERR  GOTO 1560
1460 READ Z(NSECT + 1),LABEL$(NSECT + 1),C(NSECT + 1)
1470 NSECT = NSECT + 1
1480 IF C(NSECT) > 0 AND C(NSECT) < 7 THEN 1510
1490 PRINT "ERROR-COLORS MUST BE IN THE RANGE 1-6"
1500 STOP
1510 T = T + Z(NSECT)
1520 GOTO 1460
1530 REM   +-------------------------+
1540 REM   : CHECK FOR END OF DATA :
1550 REM   +-------------------------+
1560 IF  PEEK (222) = 42 THEN 1600
1570 L =  PEEK (218) +  PEEK (219) * 256
1580 PRINT "APPLE ERROR NUMBER "; PEEK (222);" IN LINE #";L
1590 STOP
1600 POKE 216,0
1610 REM   +----------------------------+
1620 REM   : NORMALIZE THE INPUT VALUES :
1630 REM   +----------------------------+
1640 FOR I = 1 TO NSECT
1650 A(I) = Z(I) / T * PI
1660 NEXT I
1670 REM   +--------------------+
1680 REM   : DRAW THE PIE CHART :
1690 REM   +--------------------+
1700 HGR2
1710 FOR I = 1 TO NSECT
1720 ALPHA = BETA
1730 BETA = BETA + A(I)
1740 FOR J = ALPHA TO BETA STEP 0.01
1750 HCOLOR= C(I)
1760 X = X1 + R *  COS (J - GAMMA)
1770 Y = Y1 + R *  SIN (J - GAMMA)
1780 HPLOT X1,Y1 TO X,Y
1790 IF C(I) <  > 0 AND C(I) <  > 4 THEN 1820
1800 HCOLOR= 3
1810 HPLOT X,Y
1820 NEXT J
1830 SI = (ALPHA + BETA) / 2 - GAMMA
1840 X2(I) = X1 + R / 1.3 *  COS (SI)
1850 Y2(I) = Y1 + R / 1.3 *  SIN (SI)
1860 NEXT I
```

```
1870  REM   +-----------------------------------------+
1880  REM   ! READ IN THE CHARACTER GENERATOR AND TABLE !
1890  REM   ! AND LABEL THE PIE CHART                  !
1900  REM   +-----------------------------------------+
1910 D$ =  CHR$ (4)
1920  PRINT D$;"BLOAD HI-RES CHARACTER GENERATOR,A$6000"
1930  PRINT D$;"BLOAD CHARACTER TABLE,A$6800"
1940  PRINT D$
1950  POKE 54,0: POKE 55,96: REM  TURN ON PRINT TO HIRES SCREEN
1960  FOR I = 1 TO 2
1970  VTAB I
1980  HTAB (42 -  LEN (TITLE$(I))) / 2
1990  PRINT TITLE$(I)
2000  NEXT I
2010  HCOLOR= 6
2020  REM   +-----------------------+
2030  REM   ! SELECT LABELING MODE  !
2040  REM   +-----------------------+
2050  ON MODE GOTO 2090,2310
2060  REM   +-----------------------------------------+
2070  REM   ! SORT BY Y VALUE OF CENTER OF SECTION !
2080  REM   +-----------------------------------------+
2090  VTAB 4:YC = 20
2110  FOR I = 1 TO NSECT
2120 K = 200
2130  FOR J = 1 TO NSECT
2140  IF Y2(J) >  = K THEN 2170
2150  IF Y2(J) = 0 THEN 2170
2160 K = Y2(J):L = J
2170  NEXT J
2180  REM   +----------------------+
2190  REM   ! LABEL EACH SECTION  !
2200  REM   +----------------------+
2210  PRINT
2220 Y2(L) = 0
2230  PRINT LABEL$(L)
2240 YC = YC + 16
2250  HPLOT 3 +  LEN (LABEL$(L)) * 7,YC TO X2(L),K
2260  NEXT I
2270  GOTO 2520
2280  REM   +-----------------------------------------+
2290  REM   ! LABEL EACH SECTION WITH LETTER CODE !
2300  REM   +-----------------------------------------+
2310 J =  ASC ("A") - 1
2320  FOR I = 1 TO NSECT
2330  PRINT
2340  PRINT  CHR$ (J + I);"=";LABEL$(I)
2350 CV =  PEEK (37) + 1
2360  VTAB Y2(I) / 8 + 1
2370  HTAB X2(I) / 7 + 1
2380 Y2(I) =  INT (Y2(I) / 8) * 8 + 2
2390 X2(I) =  INT (X2(I) / 7) * 7 + 3
2391  REM   +-----------------------------------------+
2392  REM   ! FIRST DRAW BLACK BACKGROUND FOR LETTER KEY !
2393  REM   +-----------------------------------------+
2400  HCOLOR= 0
2410  IF C(I) = 5 THEN  HCOLOR= 4
2420  FOR K = 1 TO 16
2430  HPLOT X2(I) - 8,Y2(I) - 8 + K TO X2(I) + 8,Y2(I) - 8 + K
2440  NEXT K
2450  PRINT  CHR$ (J + I)
2460  HTAB 1
2470  VTAB CV
2480  NEXT I
2490  REM   +-----------------------------------------+
2500  REM   ! TYPE ANY CHARACTER TO RETURN TO TEXT MODE !
2510  REM   +-----------------------------------------+
2520 X =  PEEK ( - 16384)
2530  IF X < 128 THEN 2520
2540  POKE  - 16368,0
2550  PRN 0
2560  TEXT
2570  END
2580  REM   +-----------------------------------------+
2590  REM   ! BEGIN INPUT DATA                        !
2600  REM   +-----------------------------------------+
2610  REM   ! COLOR=1 GREEN (DEPENDS ON TV)           !
2620  REM   ! COLOR=2 BLUE (DEPENDS ON TV)            !
2630  REM   ! COLOR=3 WHITE                           !
2640  REM   ! COLOR=4 BLACK                           !
2650  REM   ! COLOR=5 DEPENDS ON TV (ORANGE ON MINE) !
2660  REM   ! COLOR=6 RESERVED FOR POINTER            !
2670  REM   +-----------------------------------------+
2680  DATA  19,1
2690  DATA  SYSTEM DEVELOPMENT ACTIVITIES
2700  DATA  (TYPICAL PROJECT)
2710  DATA  5,PROJ. MGMT. 5%,3
2720  DATA  15,FUNC. STUDY 15%,1
2730  DATA  20,SYST. DESIGN 20%,2
2740  DATA  30,PROG. 30%,3
2750  DATA  15,DOCUMENTATION 15%,5
2760  DATA  15,TEST/DEBUG 15%,4
```

```
A               1340  1650  1730
ALPHA           1720  1740  1830
BETA            1720  1730  1740  1830
C               1320  1460  1480  1750  1790  2410
CV              2350  2470
D$              1910  1920  1930  1940
GAMMA           1270  1310  1760  1770  1830
I               1380  1390  1400  1410  1640  1650  1660  1710  1730  1750  1790  1840  1850  1860
                1960  1970  1980  1990  2000  2110  2260  2320  2340  2360  2370  2380  2390  2410
J               1740  1760  1770  1820  2130  2140  2150  2160  2170  2310  2340  2450
K               2120  2140  2160  2250  2420  2430  2440
L               1570  1580  2160  2220  2230  2250
LABEL$          1320  1460  2230  2250  2340
MODE            1270  1280  2050
NSECT           1460  1470  1480  1510  1640  1710  2110  2130  2320
PI              1230  1310  1650
R               1230  1760  1770  1840  1850
SI              1830  1840  1850
T               1510  1650
TITLE$          1340  1390  1400  1980  1990
X               1760  1780  1810  2520  2530
X1              1230  1760  1780  1840
X2              1330  1840  2250  2370  2390  2430
Y               1770  1780  1810
Y1              1230  1770  1780  1850
Y2              1330  1850  2140  2150  2160  2220  2360  2380  2430
YC              2090  2240  2250
Z               1320  1460  1510  1650
```


STOCK MARKET ANALYSIS PROGRAM
DJI WEEKLY AVERAGE 1897-DATE

ANA1* (ANALYSIS 1) is a set of BASIC Programs which enables the user to perform analyses on the Dow Jones Industrial weekly average data. From 6 months to 5 years of user selected DJI data can be plotted on the entire screen in one of 5 colors using Apples' High Resolution capabilities. The DJI data can be transformed into different colored graphic representations called transforms. They are: user specified moving averages; a least squares linear fit (best straight line); filters for time, magnitude, or percentage changes; and user created relationships between the DJI data, a transform, or a constant using +,-,x,/ operators. Colored lines can be drawn between graphic points. Graphic data values or their dates of occurrence can be displayed in text on the screen. Any graph or text can be outputted to a users printer. The Grid Scale is automatically set to the range of the graphs or can be user changed. As many colored graphs as wanted can be plotted on the screen and cleared at any time. The user can code routines to operate on the DJI/transform data or create his own disk file data base. ANA1 commands can be used with his routines or data base. An Update program allows the user to easily update the DJI file with current DJI weekly data.

The ANA1 two letter user commands are: CA = Calculate, no graph. CG = Clear Graphs, leave Grids. CK = Checking out program, known data. CO = Color of next graph (red, green, violet, white, blue). CS = Clear Screen. DL = Draw Line between points. FI = Filter data for time, magnitude, or percent change. FU = Data, transform, or constant Function with +,-,x,/ operator. GD = Graphic mode, display all Graph Data on screen. GR = Graph data to screen. GS = Set Grid Scale. HE = Help, summary of any commands usage. LD = Load Data from disk file from inputted date to memory. LG = Leave Graphs, automatic Grid rescaling. LO = Look, select a range of the LD data and GR; All commands can now be used on this range. LS = Least squares linear fit of the data. MA = Moving Average of the data. NS = No Scale, next graph on screen does not use Grid Scale. NT = No Trace. PR = User implimented Printer routine. TD = Text mode, display Text Data on screen. TI = Time number to date or vice versa. TR = Trace. TS = Text Stop for number of lines outputted to screen when in TD. U1/U2 = User 1/2 implimented routines. VD = Values of Data outputted in text. VG = Values of Grid; low/high/delta. VT = Values of Transform outputted in text.

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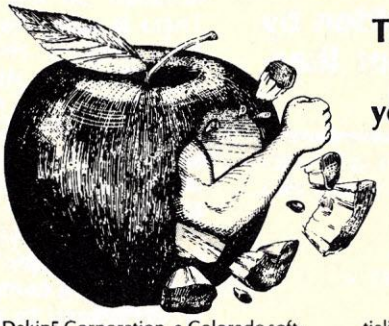
SAN DIEGO, CA 92122

* Software Review in Call-A.P.P.L.E. (2/80): "An example of an excellent piece of software exploiting most of Apple II's major features." Overall Rating = 92.1

* Software Review in Apple Orchard (3/80): "A remarkably flexible approach to the analysis and plotting of any time series data." Overall Rating = 85.7

CIRCLE 145 ON READER SERVICE CARD



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DAKIN5 CORPORATION

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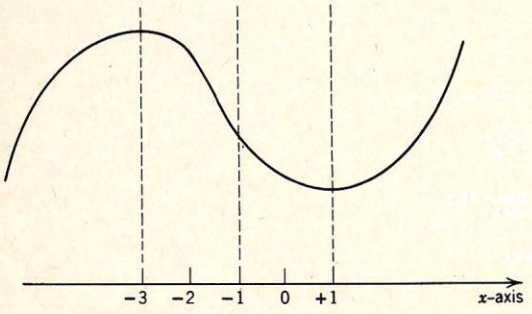
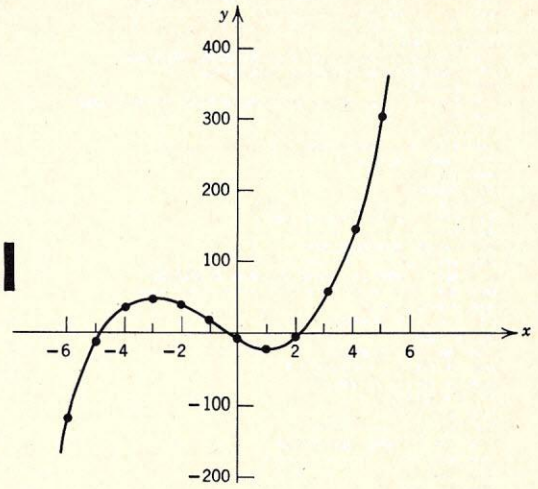
CIRCLE 120 ON READER SERVICE CARD



Individual Graphing of Mathematical Functions



Doug Schiffer
&
Sarah Brooks, Ph.D.

A problem that frequently appears in mathematics courses is the individual graphing of a handful of different mathematical functions. (y=sin(x), y = log (4.2*x), y=2*x+3 etc.). One way to have the computer do this is to write a program that has as many DEF statements as you have functions. You then have a separate graphing loop for each graph. The program would look something like this:

```
10 DEF FNA(x) = SIN(x)
20 DEF FNB(x) = LOG(4.2*x)
30 DEF FNC(x) =
        •
        •
        •
500 FOR I = A TO B STEP C
510 Y = FNA(I)
520 GOSUB 1000 ! GRAPHING
      SUBROUTINE
530 NEXT I
        •
        •
600 FOR I = A TO B STEP C
610 Y = FNB(I)
620 GOSUB 1000
630 NEXT I
```

The computer rewrites the function definition by itself; the program literally rewrites itself.

The resulting program is very large and not at all elegant,especially if you have a large number of functions. Of course you can write a program with only one "DEF" statement and let the user of the program change the function after every run. The problem here is that students with no previous computing experience have trouble logging on the system, calling up the program, and operating the programs in general. It is also extremely hard for them to modify the programs. Furthermore, it is very distracting and time consuming to keep starting and stopping the program.

The solution we found uses a variation on the second technique. There is only one DEF statement but the computer rewrites the function definition by itself; the program literally rewrites itself. Two versions are provided. One is for a compiler (Digital PDP 11/40 Basic). The other is designed for an interpreter (Mits 12K Basic).

The two versions go about this "self-modification" in two different ways. For the compiler version, control is transferred to a special editor-like program (SETUP) via the CHAIN instruction. SETUP then reads the source code version of TABFUN into a string matrix (each line of TABFUN is one element of the string matrix). The user is then asked what function he/she would like to graph. (One types sin(x*PI)+3 if that is the function he/she wants). SETUP then combines the element of a DEF statement (line#,"DEF FNA(x) = " and the user supplied string) to make a legal Basic statement. This string replaces the element of the string matrix that contained the old function definition. At this point the old TABFUN on the disk is erased and the string matrix is written onto the disk in its place. Control returns to TABFUN via the CHAIN command.

The same technique could have been used in TABFN1, the interpreter diversion. But since most smaller computers don't have a disk-based language with the CHAIN command, an alternative approach is in order. Here the program searches the core memory for a 'D' followed by an 'E' followed by 'F' . . . When it finds this spot it stops and asks for a new function like the compiler version. The new string is then POKEd into successive locations following the '=' sign. A carriage return plus an END statement are added for proper execution.

Self-modifying programs can wipe themselves out (for example, the program is the same after the run, only minus a mere 57 lines).

Control then returns to the main graphing and tabulating routines.

Of course, aspects of a program other than mathematics functions could be modified in the same way. Definitions, string functions, DIM statements, setting of constants, or even program logic could also be changed with equal ease. The replace statements could come from the user or a special data file.

A final comment on self-modifying programs: *BE CAREFUL.* Ordinary programs, when they "bomb," just produce extraneous outputs. Self-modifying programs can do that and/or wipe themselves out (for example, the program is the same after the run, only minus a mere 57 lines). It's a good idea to save the program on paper tape, cassette, or somewhere safe on the disk before you run it on experimental or first time basis. □

Doug Schiffer & Sarah Brooks, Ph.D., Mathematics Dept., Mohawk Valley Community College, 1101 Sherman Drive, Utica, NY 13501.

LISTING OF "TABFUN.BAS" ON 25-Oct-78 AT 11:30 AM

```
10 INPUT"X RANGE AND # OF SUBDIVISIONS";A,B,N
20 IF A=0 AND B=0 THEN 100
30 &"X","Y"
40 FOR X=A TO B STEP (B-A)/N
50 &X,FNA(X)
60 NEXT X
70 INPUT"DO YOU WANT TO CHANGE X RANGE";A$
80 IF A$="YES" OR A$="Y" THEN 10
90 INPUT "DO YOU WANT A GRAPH OF FUNCTION";B$
100 IF B$="N" OR B$="NO" THEN 330
110 INPUT"X RANGE AND # OF SUBDIVISIONS";A1,B1,N1
120 INPUT"Y RANGE AND # OF SUBDIVISIONS";Y1,Y2,N2
130 IF A1<>0 OR B1<>0 THEN A=A1:B=B1
140 IF N1<>0 THEN N=N1
150 IF Y1<>0 OR Y2<>0 THEN 220
160 Y1=1E38:Y2=-1E38
170 FOR X=A TO B STEP (B-A)/N
180 IF FNA(X)>Y2 THEN Y2=FNA(X)
190 IF FNA(X)<Y1 THEN Y1=FNA(X)
200 NEXT X
210 IF N2=0 THEN N2=70
220 &'GRAPH OF FUNCTION X='A'TO'B',INCREMENT:';(B-A)/N
230 &TAB(22);'Y='Y1'TO'Y2',INCREMENT:';(Y2-Y1)/N
240 FOR X=A TO B STEP (B-A)/N
250 Y=FNA(X)-Y1
260 P=INT(Y/(Y2-Y1)*N2+.5)
270 &CHR$(10);
280 IF POS(0)>P THEN &CHR$(8); :GOTO 280
290 IF POS(0)<P THEN &TAB(P);
300 &'*';
310 NEXT X
320 &
330 INPUT"DO YOU WANT TO CHANGE FUNCTION";C$
340 IF C$='Y' OR C$='YES'THEN CHAIN'SETUP'
350 INPUT'DO YOU WANT TO RUN AGAIN';D$
360 IF D$='G' OR D$='GRAPH' THEN 110
370 IF D$='F' OR D$='FC' THEN CHAIN'SETUP'
380 IF D$='Y' OR D$='YES' THEN 10
390 DEF FNA(X)=LOG(X)
400 END
```

Ready

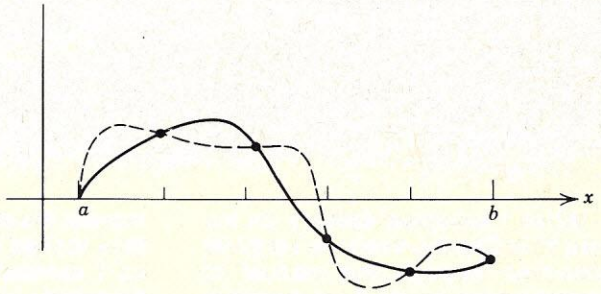
LISTING OF "SETUP.BAS" ON 25-Oct-78 AT 11:33 AM

```
10 ! SETUP - PUTS FNA IN "TABFUN"    D. SCHIFFER 10/77
20 OPEN"TABFUN.BAS" AS FILE 1
30 DIM A$(40)
40 INPUT LINE #1,A$(I) FOR I=1 TO 40
50 INPUT "FNA(X)=";F$
60 KILL"TABFUN.BAS":OPEN"TABFUN.BAS"AS FILE 1
70 A$(39)="390 DEF FNA(X)="+F$+CHR$(13)+CHR$(10)
80 &#1,A$(I); FOR I=1 TO 40
90 CLOSE 1
100 &"-"; FOR I=1TO 40
110 CHAIN"TABFUN.BAS"
120 END
```

Ready

LISTING OF "TABFN1.MIT" ON 25-Oct-78 AT 11:34 AM

```
10 REM VARIABLE FUNCTION GRAPHING FOR MITS 12 K BASIC
20 INPUT"X RANGE AND # OF SUBDIVISIONS";A,B,N
30 INPUT"Y RANGE AND # OF SUBDIVISIONS";C,D,N1
35 IF N1=0 THEN N1=70
40 IF C<>0 OR D<>0 THEN 100
50 C=1E37:D=-1E37
60 FOR X=A TO B STEP (B-A)/N
70 IF FNA(X)>D THEN D=FNA(X)
80 IF FNA(X)<C THEN C=FNA(X)
90 NEXT X
100 &"GRAPH OF FUNCTION X=";A;"TO";B;"STEP";(B-A)/N
110 &TAB(19);"Y=";C;"TO";D;"STEP";(D-C)/N1
120 FOR X=A TO B STEP (B-A)/N
130 P=INT((FNA(X)-C)/(D-C)*N1+.5)
140 &TAB(P);"*"
150 NEXT X
160 &"WANT TO CHANGE FUNCTION";A$
170 IF A$="NO" OR A$="N" THEN 360
180 REM NOW FOR FUNCTION CHANGE
190 FOR II=0 TO 12287
200 IF PEEK(II)<>68 THEN 300
210 FOR KK=1 TO 6
220 READ JJ
230 DATA 69,70,32,70,78,65
240 IF JJ<>PEEK(II+JJ) THEN RESTORE:GOTO 300
250 NEXT KK
260 GOTO 320
300 NEXT II
310 &"ERROR":STOP
320 INPUT"FNA(X)=";F$
325 F$=F$+CHR$(10)+CHR$(13)+"999 END"+CHR$(10)+CHR$(13)
330 FOR LL=1 TO LEN(F$)
340 POKE II+JJ+LL+10,ASC(MID$(F$,LL,1))
350 NEXT LL
360 INPUT"RUN AGAIN";B$
370 IF B$="YES" OR B$="Y" THEN 10
380 DEF FNA(X)=SIN(X)
```



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Plot With the Devil

Jay Hansche, Ph.D.

When I accepted delivery on my Xerox 1720 Communications Terminal I skimmed through the manual to determine how to set it up correctly and to see what its special characteristics were. I noticed some sections on plotting but I was very eager to get along into word processing and number crunching, so I stored the information in the back of my head for future reference. Recently, as I was evaluating some complicated research results involving the interrelationships of ellipsoids in three-dimensional space, it occurred to me that the results could be interpreted as ellipses in two-dimensional space. I decided to have another look at the manual.

I was pleasantly surprised to find that my machine follows Diablo instructions very nicely.

The first thing I discovered from this closer look was that my manual had a big *Preliminary* on the cover and it described a Diablo machine called the Hyterm Model 1641. The cover also reported that Diablo was a Xerox company, a relationship I was already aware of through inspection of my terminal. Though the word 'Xerox' is prominent on the outside cover, when the cover is removed all the inner labels say 'Diablo.' The illustrations in the manual are all of Diablo machines, but they looked very similar to the Xerox, so I decided to give it a try. I was pleasantly surprised to find that my machine follows Diablo instructions very nicely. (I have seen the Radio Shack daisywheel printers, but I could not get access to a technical manual on them so I have no idea of whether or not they can perform this type of operation.)

Plotting, or Graphics, as the manual calls it, turns out to be relatively simple. When given a special instruction (ESC 3) the terminal shifts into Graphics mode. In this mode carriage movement is unrelated to printing: printing a character does **not** produce carriage movement. Instead, the space and backspace instructions produce $1/60$" of carriage movement rather than the standard $1/10$" or $1/12$". The line feed and negative line feed instructions produce only $1/48$" of paper movement, as compared to the standard line of $1/6$". The manual provides the proper ASCII codes for these instructions and that was enough to get me started.

My program was written on a DECSYSTEM-2060 in what they call Basic-PLUS-2. I had written a number of plot routines, so this job presented few problems. The one problem that caused me the greatest difficulty was an interaction between the operating system (OS) and the Basic compiler. The program executes a lot of print statements that are not ordinary printing, so I didn't want the OS to generate carriage returns. The system command 'terminal width 0' is supposed to provide infinite line width, but when I tried it 'infinite' turned out to be 60. I fought with this problem for quite a while before I found some fine print in the back of the Basic manual which suggested that DEC Basic *also* controls line width at the terminal. What was happening was that Basic checked the system terminal parameters. When Basic saw the 'terminal width 0,' Basic set it back to 60. Thank you, Basic. But the manual also described a MARGIN (right margin) command and, when I included 'MARGIN 100000' in my program, things began dropping in place. I hope that most computer systems won't generate this type of problem.

The system command 'terminal width 0' is supposed to provide infinite line width, but when I tried it 'infinite' turned out to be 60.

DECSYSTEM Basic-PLUS-2 is really a fine programming language, combining many of the best features of Fortran and Cobol, as well as some of the error-trapping features of Pascal. However, that wouldn't do for publication. It was with great regret that I went through my finished program and replaced all the fancy string functions, integer mode variables and implicit loops with their more standardized Basic equivalents. The original version, for example, included *no* NEXT

Jay Hansche, Ph.D., Psychology Department, Tulane University, New Orleans, LA.

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Plot, cont'd...

statements or INT functions. The program now contains nothing more esoteric than the CHR$ function to put an ASCII character into a string variable and some string concatenation. I hope I have included enough comments to make the program easy to follow.

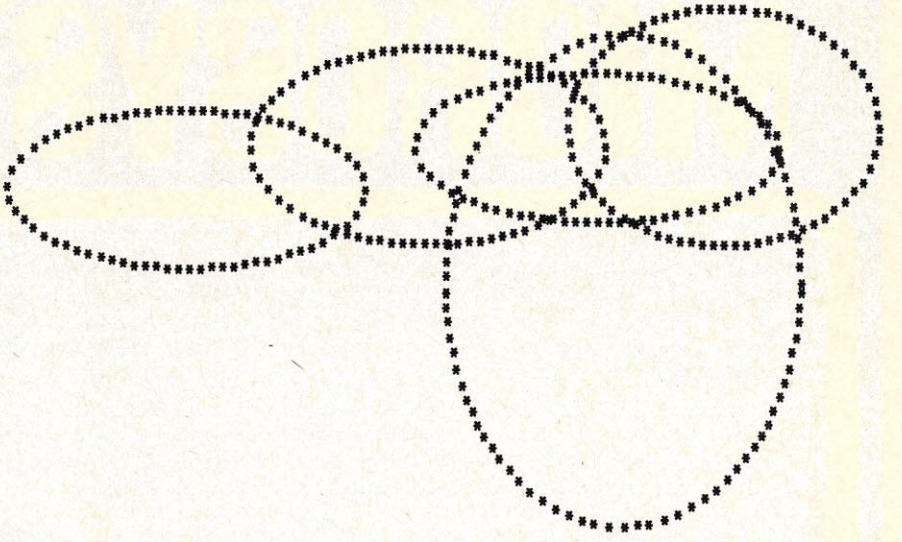
Though I was initially motivated to write this program to plot my ellipses, I knew that when the program worked I would be interested in other plots, so I decided to write the program to read any list of X,Y coordinates and plot them. Next I generated a file of the X,Y coordinates for the ellipses and let the program take the values from the file. The program can plot any points, not just ellipses, and of course the set of file reference statements (520-590) can be replaced by an algorithm to generate points. The only requirements to run the program are that you should have a fairly good idea of the highest and lowest values of both X and Y so these ranges can be scaled to fit the printer.

The tractor (mine anyway) is designed to move the paper in only one direction, and negative line feeds do not work well at all.

If you routinely run your machine with a forms tractor that *pulls* the paper through the machine, as I do, you should remove the tractor and insert the paper in standard typewriter fashion around the platen. The tractor (mine anyway) is designed to move the paper in only one direction, and negative line feeds do not work well at all. Also, my machine has a toggle switch to vary pitch from 10 to 12 characters per inch. I run at 12, and the program was written on that basis. If you are running at 10 characters per inch, go to line numbers 680 and 690 and change the 5's to 6's.

The program plots with asterisks. If you would rather use some other character that should be easy to change. The program also has a system for preventing plot-points from being too close together. If you want to vary the spacing between plot-points, your algorithm should generate more points than you plan to use (I have 300 data points for each ellipse). Line number 660 controls the spacing between points, and this can be varied by changing the value of the constant '20' in that statement. Now all you have to do is look through your back issues of *Creative Computing* for the Lissajous programs and you're in business, plotting with the Diablo. □

```
RUNNH
ENTER HIGHEST AND LOWEST VALUES ON X.
 ? 3,-5
ENTER HIGHEST AND LOWEST VALUES ON Y.
 ? 3,-3
```



```
00100 REM ***THIS PROGRAM WAS WRITTEN TO DEMONSTRATE THE PLOT AND GRAPHIC
00110 REM ***CAPABILITIES OF XEROX AND DIABLO COMMUNICATIONS TERMINALS.
00120 REM ************************************************************
00130 REM         IF YOU ARE RUNNING ON A TIME-SHARING SYSTEM, BEFORE
00140 REM     YOU GET INTO 'BASIC' YOU MUST SET SYSTEM TERMINAL
00150 REM     PARAMETERS SO THEY DO NOT INTERFERE WITH PAGE WIDTH AND
00160 REM     LENGTH VALUES AS NEEDED BY THIS PROGRAM.
00170 REM                 ********************************
00180 REM     WRITTEN ON DECSYSTEM-2060 IN BASIC-PLUS-2 BY
00190 REM             JAY HANSCHE,
00200 REM             PSYCHOLOGY DEPARTMENT,
00210 REM             TULANE UNIVERSITY,
00220 REM             NEW ORLEANS, LOUISIANA.
00230 REM ************************************************************
00240 MARGIN 100000           !OPEN RIGHT MARGIN.
00250 REM***DEC BASIC WILL SET RIGHT MARGIN IF THE PROGRAM DOESN'T.
00260 PRINT "ENTER HIGHEST AND LOWEST VALUES ON X."
00270 INPUT XHI,XLO
00280 PRINT "ENTER HIGHEST AND LOWEST VALUES ON Y."
00290 INPUT YHI,YLO
00300 XRANGE=XHI-XLO          !SCALE X TO FIT TERMINAL WIDTH.
00310 XSCL=XRANGE/12
00320 XMID=(XLO+XRANGE/2)/XSCL
00330 YRANGE=YHI-YLO
00340 YMID=(YLO+YRANGE/2)/XSCL        !SAME TRANSFORM FOR Y.
00350 LF$=CHR$(10)            !ASCII LOAD FOR LINE FEED. (PAPER UP)
00360 CTR=(YRANGE/2)*6+3
00370 FOR I=1 TO CTR
00380 PRINT LF$;              !FEED UP TO START PLOT.
00390 NEXT I
00400 SP$=CHR$(32)            !ASCII LOAD FOR SPACE.
00410 BS$=CHR$(8)             !ASCII LOAD FOR BACKSPACE.
00420 FOR I=1 TO 75
00430 PRINT SP$;              !SPACE RIGHT TO CENTER.
00440 NEXT I
00450 REM***STRING CONCATENATION FOR NEXT THREE VARIABLES.
00460 GR$=CHR$(27)+CHR$(51)   !ASCII FOR SHIFT TO GRAPHICS MODE.
00470 NGR$=CHR$(27)+CHR$(52)  !ASCII TO  SHIFT OUT OF GRAPHICS.
00480 NLF$=CHR$(27)+CHR$(10)  !ASCII LOAD FOR NEGATIVE LINE FEED.
00490 PRINT GR$;              !SHIFT TO GRAPHICS MODE.
00500 XALD=0                  !(X INCR=1/60", Y INCR=1/48".)
00510 YALD=0                  !START PLOT FROM X=0,Y=0.
00520 REM***INSERT YOUR ALGORITHM TO GENERATE X,Y COORDINATES HERE.
00530 OPEN 'ELP2.DAT' AS #1   !ALL FILE REFERENCES MAY BE REPLACED
```

```
00540 LINPUT #1, A$             !TO LINE NUMBER 590.
00550 X$=SEG$(A$,1,7)           !GET A PAIR OF X,Y VALUES FROM FILE.
00560 Y$=SEG$(A$,14,20)
00570 X=VAL(X$)
00580 Y=VAL(Y$)
00590 REM***END OF FILE REFERENCES HERE.
00600 X=(X/XSCL-XMID)/.01667   !SCALED X DIVIDED BY STEP SIZE.
00610 Y=(Y/XSCL-YMID)/.02083   !SCALED Y DIVIDED BY STEP SIZE.
00620 X=INT(X+.5)              !ROUND X AND Y.
00630 Y=INT(Y+.5)
00640 XNU=X-XALD               !COMPUTE STEPS FROM LAST PLOT POSITION.
00650 YNU=Y-YALD
00660 IF XNU^2+YNU^2<=20 THEN 1210    !IF MOVE IS LESS THAN 20, FORGET IT.
00670 IF ABS(XNU)<29 THEN 830 !POINTS TOO CLOSE DON'T PLOT SMOOTHLY.
00680 FSP=INT(XNU/5)           !IF LONG MOVE ON X, SHIFT OUT OF GRAPHICS.
00690 XNU=MOD(XNU,5)           !FSP=NUMBER OF FULL SPACES TO MOVE.
00700 IF FSP<0 THEN 770        !XNU=REMAINDER TO MOVE IN GRAPHIC MODE.
00710 PRINT NGR$;              !OUT OF GRAPHICS.
00720 FOR I=1 TO FSP
00730 PRINT SP$;               !FULL SPACES TO X.
00740 NEXT I
00750 PRINT GR$;               !BACK TO GRAPHICS FOR REMAINDER.
00760 IF XNU=0 THEN 920 ELSE 850
00770 PRINT NGR$;              !SAME FOR BACKSPACE.
00780 FOR I=1 TO ABS(FSP)
00790 PRINT BS$;
00800 NEXT I
00810 PRINT GR$;
00820 IF XNU=0 THEN 920 ELSE 890
00830 IF XNU<0 THEN 890        !IF NEGATIVE, GO TO BACKSPACE.
00840 IF XNU=0 THEN 920        !IF ZERO, CHECK Y.
00850 FOR I=1 TO XNU
00860 PRINT SP$;               !SPACE TO LOCATION ON X.
00870 NEXT I
00880 GO TO 920                !AT X LOCATION, GO CHECK Y.
00890 FOR I=1 TO ABS(XNU)
00900 PRINT BS$;
00910 NEXT I
00920 IF ABS(YNU)<23 THEN  1080  !FOR LONG MOVE ON Y, SHIFT OUT OF GRAPHICS.
00930 NLF=INT(YNU/8)           !COMPUTE NUMBER OF FULL LINE FEEDS IN NLF.
00940 YNU=MOD(YNU,8)           !YNU = REMAINDER LESS THAN FULL LINE FEED.
00950 IF NLF<0 THEN 1020       !IF NEGATIVE, GO TO (+) LINE FEED.
00960 PRINT NGR$;              !OUT OF GRAPHICS FOR FULL FEED.
00970 FOR I=1 TO NLF
00980 PRINT NLF$;
00990 NEXT I
01000 PRINT GR$;               !BACK TO GRAPHICS FOR REMAINDER.
01010 IF YNU=0 THEN 1180 ELSE 1110
01020 PRINT NGR$;              !SAME FOR NEGATIVE LINE FEED.
01030 FOR I=1 TO ABS(NLF)
01040 PRINT LF$;
01050 NEXT I
01060 PRINT GR$;
01070 IF YNU=0 THEN 1180 ELSE 1150
01080 IF YNU<0 THEN 1150       !IF NEGATIVE, GO TO (+) LINE FEED.
01090 REM***POSITIVE VALUE OF Y TAKES NEGATIVE LINE FEED.
01100 IF YNU=0 THEN 1180       !IF NO CHANGE ON Y, GO TO PRINT STAR.
01110 FOR I=1 TO YNU
01120 PRINT NLF$;
01130 NEXT I
01140 GO TO 1180               !GO TO PRINT STAR.
01150 FOR I=1 TO ABS(YNU)
01160 PRINT LF$;
01170 NEXT I
01180 PRINT "*";       !PRINT IN GRAPHICS MODE DOES NOT MOVE CARRIAGE.
01190 XALD=X                   !STORE PRESENT X AND Y VALUES.
01200 YALD=Y
01210 IFMORE #1 THEN 540       !LOOP BACK FOR NEXT X,Y PAIR.
01220 PRINT NGR$               !TAKE TERMINAL OUT OF GRAPHICS MODE.
01230 FOR I=1 TO (Y/48-YLO)*6+3
01240 PRINT LF$;               !LINE FEED OUT OF PLOT.
01250 NEXT I
01260 CLOSE #1
01270 STOP
01280 END
```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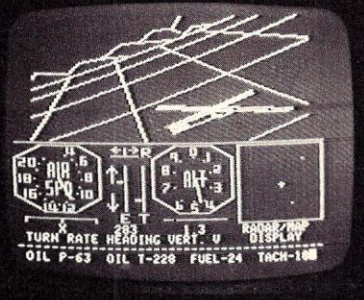

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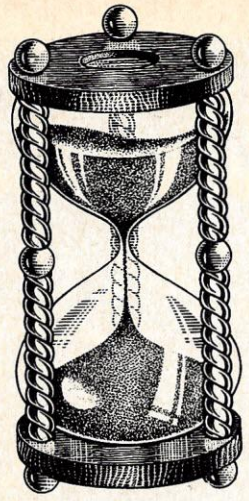


RGLASS

David Gerrold

I don't know why I was thinking about an hourglass at three in the morning, but I was lying awake and thinking that it couldn't be that hard to write an hourglass simulation.

I couldn't think of any particular need for such a program either, but it might be a good way to learn how to handle matrices, an area of Basic I had been tiptoeing around for some time.

The principles of the simulation were easy to work out, and also cured my insomnia. The next morning, though, I figured I'd better sit down and actually write the program, just to prove that the structure I'd worked out in my head was viable.

It almost was. It only took four days to debug.

And—before I was through, I'd found at least one use for it. I added it as a subroutine to a game of WUMPUS. Now, each time the player makes a move, the hourglass prints out and chonks another asterisk into the bottom half of the glass.

If you have the memory to spare, any subroutine that adds a visual element to a game makes it that much more interesting. (And it seems to me that it won't be too much longer before most users will have memory to spare for these extra little touches. It certainly makes the game seem a lot less mechanical.)

The listing here is in North Star Basic. The backslash allows more than one statement per line—and also saves five bytes per usage. (Whoopee!)

Lines 10 through 60 dimension the hourglass. However many moves your game calls for (whether determined randomly, as WUMPUS does when it allocates supplies, or not), the program will generate an hourglass with exactly that number of asterisks in it.

Lines 80 through 220 load the hourglass. When the top row is level, the number of asterisks is a perfect square, which explains why line 30 computes D1 as a square root (plus two) and then squares it. The plus two is to provide an empty top row in the hourglass itself. Line 210 subtracts as many asterisks as necessary to bring the number down to the actual number of moves.

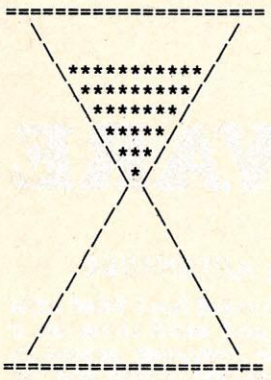
Lines 130 to 150 generate the sides of the hourglass; 92 and 47 are the ASCII values for the slash and the backslash. In line 160, the value of T5 determines whether there is an asterisk (42) or a space (32) in that position. T5 and T6 are trash variables, used for different functions throughout the program.

David Gerrold, PO Box 1190, Hollywood, CA 90028

```
LIST

10INPUT"HOW MANY GRAINS IN THE GLASS?  ",T7
20IF T7<4 THEN 10
30D1=(INT(SQRT(T7))+2)*2
40DIM T$(D1+5)
50DIM T(D1,D1+1)
60REM--VARIABLES ARE  X,Y,D1,D3,T5,T6,T7,Z
70REM----------------------------LOAD HOURGLASS
80T5=-1
90FOR X=1 TO D1
100D3=D3+1
110IF D3<>D1+2-D3 THEN 130
120T5=0\D3=D3+1
130T(X,D3)=92\T(X,D1+2-D3)=47
140FOR Y=1 TO D1+1
150IF T(X,Y)<>92 AND T(X,Y)<>47 THEN 170
160T5=T5*-1\GOTO180
170IF T5=1 THEN T(X,Y)=42 ELSE T(X,Y)=32
180NEXT Y
190NEXT X
200D3=0\REM-- TOP LEVEL MARKER FOR SIFT CONTROL
210FORZ=1 TO D1/2*D1/2-T7\GOSUB300\NEXT Z
220GOSUB490
230REM-----------------------------------RUN HOURGLASS
250GOSUB300\GOSUB380\REM ----- SIFT TOP, SIFT BOTTOM
260IF T(D1/2,D1/2+1)=42 THEN 250\REM - IF EMPTY, THEN STOP
280!"HOURGLASS IS EMPTY"\END
290REM--------------------SIFT THE TOP
300X=D3+1\Y=D1/2+1\T5=0\T6=0
310IF T(X,Y+T5)=42 THEN 340\REM - CHECK SIDE SPACES
320T6=T6+SGN(T5)
330IF NOT T6 THEN T5=ABS(T5)+1\T5=T5*-1\GOTO310
340IF T(X,Y+T5+1)>42 THEN D3=D3+1\REM-- CHECK FOR SIDE WALL
350Y=Y+T5\T(X,Y)=32
360RETURN
370REM--------------------SIFT THE BOTTOM
380X=D1/2+1\Y=X\T5=0\T(X,Y)=42
390IF X=D1 THEN 450\REM-- WE ARE FLOORED, WE CAN EXIT
400IF T(X+1,Y)=32 THEN 440\REM-- IF THE SPACE BELOW IS EMPTY, FILL IT
410T5=-1\GOSUB610\IF R THEN T5=T5*-1\T6=T5
420IF T(X+1,Y+T5)=32 THEN 440 \REM - CHECK SIDE SPACES
430T5=T5*-1\IF T5=T6THEN 450\GOTO420
440T(X,Y)=32\X=X+1\Y=Y+T5\T(X,Y)=42\T5=0\GOTO390\REM-FILL EMPTY SPACE
450GOSUB490
460RETURN
480REM---------PRINTOUT HOURGLASS
490!\!\GOSUB570
500FOR X=1 TO D1
510T$=""
520FOR Y=1TOD1+1
530T$=T$+CHR$(T(X,Y))
540NEXT Y
550GOSUB590
560NEXT X
570T$=""\FORX=1 TO D1+5\T$=T$+"="\NEXT X\GOSUB 590\RETURN
580REM-------------PRINT SUBROUTINE
590!TAB(40-LEN(T$)/2),T$\RETURN
600REM----------------RND SUBROUTINE
610R=INT(2*RND(-1))\RETURN
READY
```

```
RUN
HOW MANY GRAINS IN THE GLASS?  36
```



Lines 250 to 280 actually run the hourglass. If you use this program as a subroutine (and what else would you use it for?) then you will probably delete these lines and put your control lines in the main program.

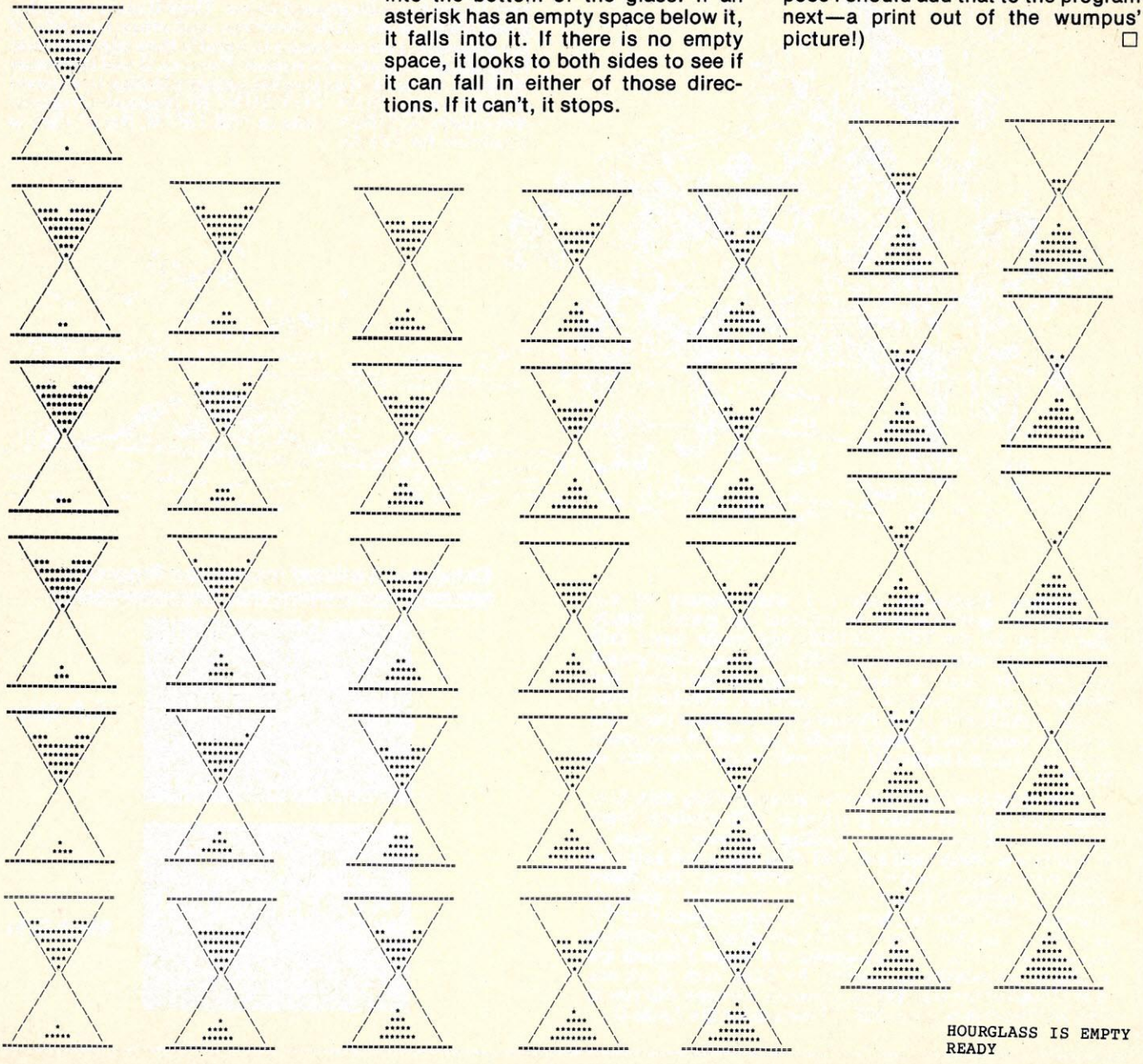
Lines 300 to 360 sift the top of the hourglass. In WUMPUS, occasionally rats eat half of your supplies. This subroutine can be used to subtract the appropriate number of asterisks from the top. (If you *find* supplies, however, adding asterisks is a bit more difficult, and I have to admit that it's a problem that I haven't exactly solved yet. Write me if you find a solution.) This sifting subroutine works from the top down, working from the center of the line to the sides before moving down to the next line of asterisks.

Lines 380 to 460 drop the asterisks into the bottom of the glass. If an asterisk has an empty space below it, it falls into it. If there is no empty space, it looks to both sides to see if it can fall in either of those directions. If it can't, it stops.

It is also possible to animate the actual falling of the asterisk if you have a CRT terminal, but since I wrote this for use on a printer, I left that particular problem for later.

Lines 490 to 570 print out the hourglass. Line 590 is the actual printing subroutine and will center the hourglass on the page. If you want to move it to the left or right, change the value of the TAB command accordingly. Line 610 is a random number subroutine called up by line 410. This is how the asterisk decides whether to look to the right or the left as it topples down the stack. It has to be done randomly or the asterisks won't pile up evenly.

The hourglass certainly adds a lot of visual suspense to a wumpus hunt. In my neighborhood, though, we don't kill our wumpi anymore. We snap their pictures. (Hmmm...I suppose I should add that to the program next—a print out of the wumpus' picture!) □



```
HOURGLASS IS EMPTY
READY
```

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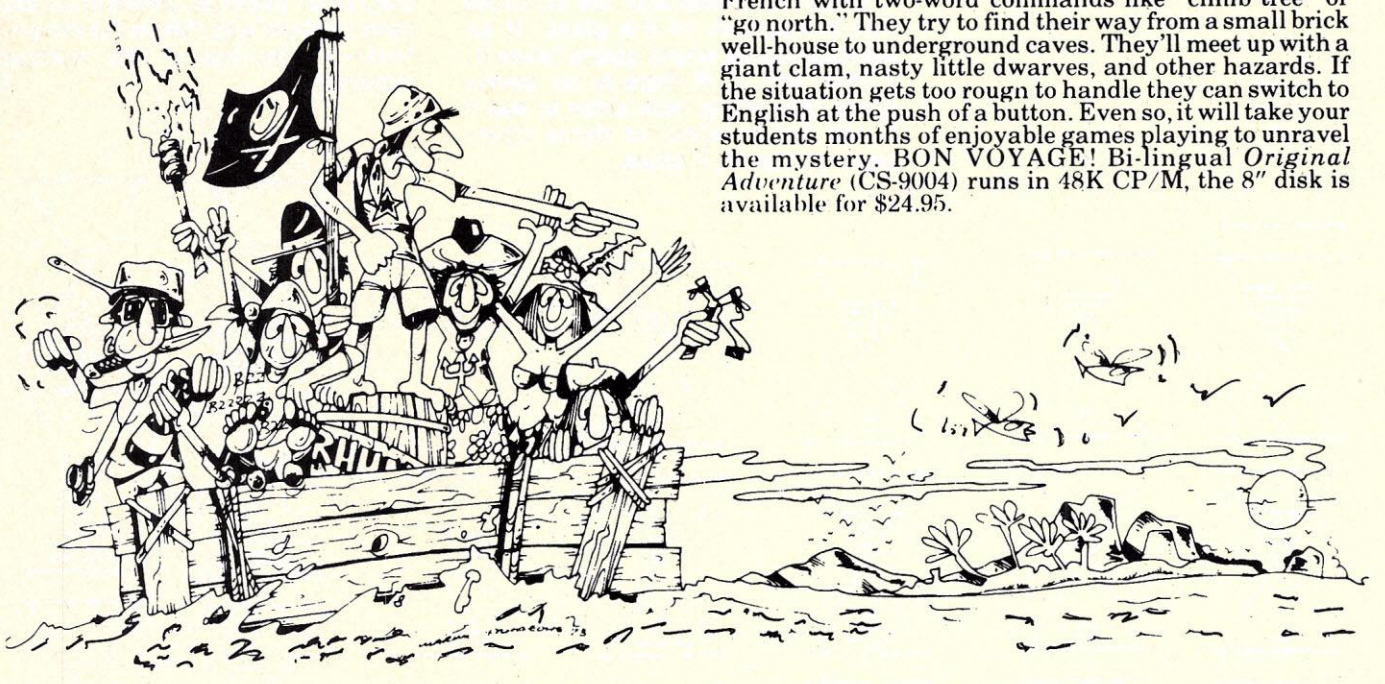

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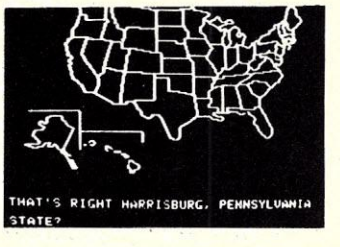
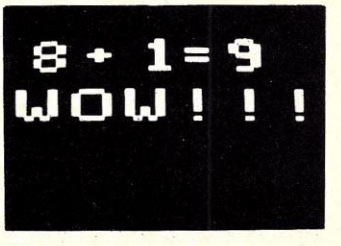


U.S. Map



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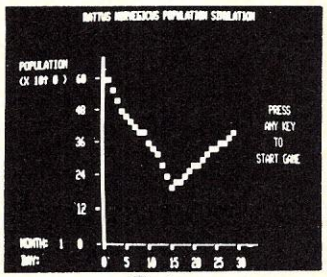
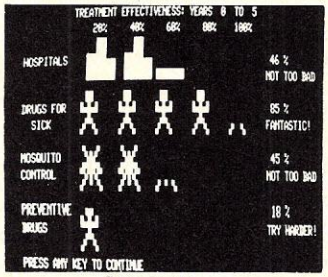
80 Software Critique on Ecology Simulations-1 Jan-March 1980

Ecology Simulations-2



Rats



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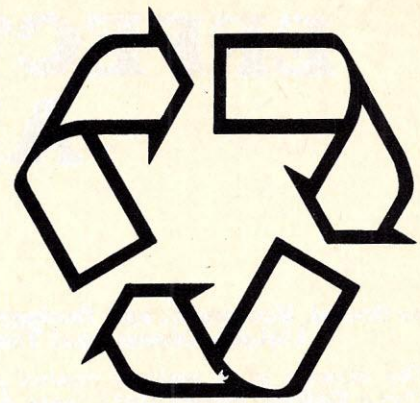
Translating Into Apple Integer Basic



Jordan Mechner

One of the biggest problems faced by Apple owners is how to convert programs found in books and magazines, written in standard Basic, into Apple Integer Basic. This Basic, designed for the Apple and the Apple's color graphics, has many strange quirks that make things very difficult for the beginner who wants to type in his favorite programs from *Basic Computer Games*.

This article describes the differences between Apple Integer Basic and standard Basic, in the hope that it will make things easier for these beginners.

Floating Point

If you ask the Apple for 2/3, it will give you a 0. If you type in 1.7, you will get a ***SYNTAX ERR. Apple Integer Basic has no floating point facility, and nothing can be done about it. This is one of the things the designers gave up in order to increase Integer Basic's efficiency.

Since Integer Basic has no floating point, it also has no SIN(), COS(), TAN(), ATN(), SQR(), LOG(), and EXP() functions. These functions are next to useless without floating point. It also has no INT() function, of course, since all numbers are integers anyway.

There are some programs to whose execution these functions are crucial. MUGWUMP, for example, from *101 Basic Computer Games*, will not work without the SQR() function. So, it's always a good idea to scan the listing of a program before you start to type it in. It would be very frustrating to have typed in half of MUGWUMP before you saw the SQR() function and realized that it wouldn't work in Apple Integer Basic.

One more point: While typing in a program, keep an eye out for occurrences of the INT() function. When you come to one, delete it.

Jordan Mechner, 85 Haights Cross Rd., Chappaqua, NY 10514.

RND

In standard Basic, the RND() function returns a random decimal between 0 and 1, for example, .77961. To get a random integer between, say, 1 and 10, you would use the formula

```
INT(RND(0)*10+1)
```

In Apple Integer Basic, however, the RND() function works differently. RND(10) returns a random integer between 0 and 9. So, to get a random integer between 1 and 10, you would use

```
RND(10)+1
```

In general, INT(RND(0)*N+1), which returns a random integer from 1 to N, can be translated into Integer Basic as RND(N)+1.

One of the most subtle and devilish differences between Apple Integer Basic and most other Basics: If the condition in an Integer Basic IF statement is false, only the first statement following the THEN is ignored and execution proceeds on the same line.

IF . . . THEN

One of the most subtle and devilish differences between Apple Integer Basic and most other Basics is its use of the IF . . . THEN statement. If you type in a program without being aware of this difference, the logic will be completely different and the program will not run at all.

Let's look at the statement

```
110 IF H=0 THEN X=X+1:Y=Y+1
```

If H=0, most Basics will execute both statements, X=X+1 and Y=Y+1. If H#0, the computer will execute neither statement, but skip directy to the next numbered line.

Apple Integer Basic thinks differently. It will execute the second statement, Y=Y+1, no matter what. Only the first statement, X=X+1, depends on whether H=0 or not.

In general: If the condition in an Integer Basic IF . . . THEN statement is false, only the first statement following the THEN is ignored and execution proceeds as usual on the same line. In standard Basic, all statements following the THEN are ignored and execution jumps to the next line.

What does this mean, practically, to someone typing in a program? It means that when you come to

```
110 IF A=B THEN A1=A:B1=B:C=0
120 ...
```

change it to

```
110 IF A#B THEN 120:A1=A:B1=B:C=0
120 ...
```

This kind of modification requires thought and understanding. It is probably the most difficult kind of change you will have to make. Be on the lookout for IF . . . THEN statements, and change the ones with more than one statement following the THEN.

Strings

The Integer Basic string handling facility is very different from that of most Basics. For one thing, strings must be dimensioned with the DIM statement. If N$ will be 20 characters long, you must type

```
DIM N$(20)
```

at the beginning of the program to avoid a ***RANGE ERR.

Also, the method of substring notation is completely different. There are no MID$(), LEFT$() and RIGHT$() functions. Instead, the following notation is used:

A$(N)	All characters of A$ starting with the Nth character.
A$(N,M)	All characters of A$ starting with the Nth character and ending with the Mth character.

What do you do when you come to a MID$(), LEFT$() or RIGHT$() in a standard Basic program? Here are some simple formulas:

```
MID$(A$,N,M) = A$(N,N+M-1)
LEFT$(A$,N)  = A$(1,N)
RIGHT$(A$,N) = A$(LEN(A$)-N+1,LEN(A$))
```

The LEN() and ASC() functions are supported as usual. The CHR$() function, however, is not. It can be simulated, if necessary, by assigning all the ASCII characters to a string:

```
A$=" !"#$%&'()*+,-./0123456789:;<=>?@ABCDE
FGHIJKLMNOPQRSTUVWXYZ  [\]^_"
```

Now,

```
CHR$(N)=A$(N-31,N-31).
```

Double Subscripts for Arrays

Apple Integer Basic allows only single subscripts, such as A(X). If you try a double subscript, such as A(X,Y), you'll get a ***SYNTAX ERR. How can you get around this seemingly serious deficiency? Very many programs, in fact any game played on a two-dimensional board, use double subscripts.

There's a simple formula. Instead of starting with

```
DIM A(R,C)
```

start with

```
DIM A(R*C)
```

And when you come to a double subscript like A(I,J), type A(C*I+J-C) instead. It will work. What you are really doing is representing a two-dimensional array as an "unraveled" one-dimensional array. (For further explanation, see *Basic Tricks*, September 1979.)

INPUT

Some Basics use the semicolon for input, as in

```
210 INPUT "SPEED";S
```

Apple Integer Basic uses the comma:

```
210 INPUT "SPEED",S
```

This is a minor difference. Otherwise, the INPUT statement is standard. It prints a ? as a prompt character for numeric input, but prints no prompt for string input.

TAB

There is no TAB() function in Apple Integer Basic. Instead, there is a TAB statement. Where a standard Basic says

```
360 PRINT TAB(X/2);"*"
```

type

```
360 TAB X/2:PRINT"*"
```

In general, TAB X is equivalent to PRINT TAB(X);.

ON . . . GOTO

Integer Basic has no ON . . . GOTO statement. The best thing to do is to "do it the long way." That is, replace

```
600 ON X GOTO 1000,1290,640
```

with

```
600 IF X=1 THEN 1000:IF X=2 THEN 1290:
    IF X=3 THEN 640
```

When the line numbers are incremented evenly, as in

```
20 ON X GOTO 100,110,120,130,140
```

you can take a shortcut:

```
20 GOTO 10*X+90
```

READ . . . DATA

This is another feature Apple Integer Basic is missing. Again, the only substitute is to do it the long way. Instead of

```
70 FOR I=1 TO 10:READ A(I):NEXT I
3000 DATA -10,7,310,0,0,-1,6,12,-310,-310
```

use

```
70 I(1)=-10:I(2)=7:I(3)=310:I(4)=0:I(5)=0:
   I(6)=-1:I(7)=6:I(8)=12:
   I(9)=-310:I(10)=-310
```

□

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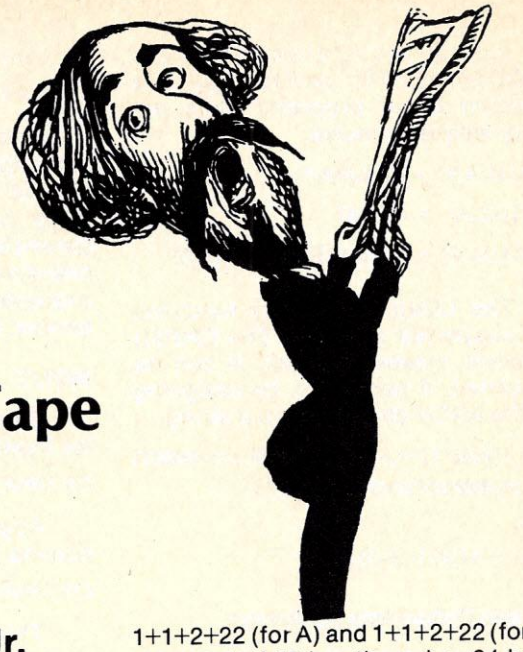

Apple II: Reading Data From Tape

Bruno B. Wolff, Jr.

You have an Integer Basic program which has relatively large arrays of data. For instance, you have financial data to read into an analysis program; or, as I do, a baseball program which needs repeated updating of player records; or a table of department names that needs periodic updating.

Although Integer Basic does not have a DATA statement, there are three other ways to get these data into your program. First, you can assign each element individually. If you have lots of memory and the data will not change, this is not a bad way to do it. Second, you can enter data using the INPUT operator in your program. This is fine if you have a relatively small amount of data to enter each time you want to run the program.

Finally, for large amounts of data or for data that need periodic updating, you can read data into your program using the techniques I will describe.

Follow these steps to create, write, and read the data.

1. Create the data with a separate program.

2. Write the created data to tape from the data creation program.

3. Read the data into your execution program.

That sounds easy, so let's see how to do it using a simple example.

First create the data. Start by setting the write arrays as your first statement.

```
100 DIM A(10),B(10)
```

This act sets up memory location starting at $800 (hex address 800, decimal 2048) to store the data.

Now let's write a simple input program.

```
110 FOR J = 1 TO 10
120 INPUT "KEY IN DATA ITEM 1",C
```

Bruno B. Wolff, Jr., 2004 E. Kensington Blvd., Shorewood, WI 53211.

We'll add a simple edit step to prevent a 32767 error.

```
130 IF C < 328 THEN 150
140 PRINT "DATA ITEM TOO LARGE":
    GO TO 120
150 INPUT "KEY IN DATA ITEM 2",D
160 A(J)=(C*100+5)/D
170 B(J)=J+100
180 NEXT J
```

Now you need to determine two important locations in memory — the starting address of the area of memory you want to write and the ending address of that area. Since Integer Basic starts assigning variables to memory at $800 (unless you change it by changing LOMEM), you know the starting address right off. You can find the ending address two ways. One, you can calculate it: or, two, you can read it by looking at the memory location with the monitor.

Now you need to determine two important locations in memory — the starting address of the area of memory you want to write and the ending address of that area.

First let's calculate it. Integer Basic needs one byte for each character in the variable name. (You may want to refer to page 35 and following in the red book.) Then it has a byte for the DISPLAY option. Then two bytes for the next variable address. Then there are two bytes for each element in the array. The number of elements is the dimension number plus 1 since element 0 is the first element. So we have 1+1+2+22 (for A) and 1+1+2+22 (for B) or a total of 52 locations, i.e., 34 hex.

Now we add the number of bytes needed to our starting location minus 1 to get the ending address.

Hexadecimal	Decimal
800	2048
+ 34	+ 52
- 1	- 1
833	2099

A second way to find the starting and ending address is to use the monitor. To do this you have to RUN the program. The program will run to line 120. Then hit the reset key. You'll get the monitor prompt "*."

Input 800.803 to see the first four bytes of variable memory. The computer will respond:

```
800  C1 00 1A 08
```

"C1" is the hex notation for "A." "00" says the display option is off. "1A 08" says the next variable starts at $81A.

Next input 81A.81D to display the variable "B" and the location of the next variable. The machine will respond 81A C2 00 34 08. "C2" is the hex notation for "B." "00" shows the display option is off, and "34 08" says the next variable starts at $834. From that we conclude the last location we want to write is one less than $834 or $833.

Now Control C back into Basic.

Now that we know the start and end addresses, we have to put them into the computer.

The starting address is loaded in decimal locations 60 (low order) and 61 (high order). The ending address is loaded into 62 (low order) and 63 (high order).

Take the hex starting address of 800 and separate the low order and high order bytes. Low order = 00, high order = 8. The decimal equivalent of 00 is 0, and 8 is 8. Simple enough.

Now take the ending location 833. The decimal equivalent of the low order byte 33 is 51(3*16+3). The high order byte 8 converts easily to 8 decimal.

```
190 POKE 60,0
200 POKE 61,8
210 POKE 62,51
220 POKE 63,8
```

Another way to compute the poke address is to take the decimal address and compute the low-order byte by using the MOD function with 256 as modulus and divide the decimal address by 256 to find the high order byte. So an alternative way is to POKE as follows:

```
170 POKE 60,2048 MOD 256
180 POKE 61, 2048/256
190 POKE 62, 2099 MOD 256
200 POKE 63, 2099/256
```

There are two ways of looking at the same thing. One is just as good as the other. If you look at the monitor, the first method is easier. If you count, the second way is easier.

The next thing we have to do is CALL the program that writes to the tape. First let's give ourselves a message to position our tape and put the program on hold until we're ready.

```
230 DIM A$(1)
240 PRINT "POSITION TAPE AND SET IN
    RECORD MODE"
250 INPUT "HIT RETURN WHEN READY",A$
260 CALL-307
270 PRINT "WRITE COMPLETED"
280 END
```

Now that wasn't too bad, was it?

The final thing we have to do now is write the program that will use the data created in program 1.

These are two ways of looking at the same thing. One is just as good as the other. If you look at the monitor, the first method is easier. If you count, the second way is easier.

We'll do a simple program to read and print the data we read in. The most important thing to remember is that the create-data program and the use-data program must start out with the same dimension statement.

```
100 DIM A(10),B(10)
```

Now we POKE the read addresses we already computed when setting up the write program.

```
110 POKE 60,0
120 POKE 61,8
130 POKE 62,51
140 POKE 63,8
```

Then we set up to read in the arrays.

```
150 DIM A$(1)
160 PRINT "POSITION TAPE AN
    PLAY MODE"
170 INPUT "WHEN READY START TAPE AND
    HIT RETURN", A$
180 CALL-259
190 PRINT "READ COMPLETED"
```

Now we'll clear the screen and print the data, adding a delay so you can read the message in 190.

```
200 FOR J=1 TO 300: NEXT J
210 CALL-936
220 PRINT "B     A"
230 PRINT
240 FOR J = 1 TO 10
250 PRINT B(J);
260 PRINT "  "; A(J)
270 NEXT J
280 END
```

There you have it. A few points to remember: to compute the variable length be sure to add one byte for each letter in your variable name and the number of bytes includes subscript 0. For string variables each variable has one byte for each cell plus a termination byte (set to 1E) which marks the end of the string.

To review, then, for numeric variables the total number of bytes is:

```
          L  letters in a name
         +1  display byte
         +2  address of next variable
+(N+1) *  2  two bytes for each cell
             (Dimension N plus 1).
```

For strings:

```
          L  letters in name
         +1  display byte
         +2  address of next variable
+(N+1)       one byte for each cell
             (dimension N plus one)
         +1  termination byte
```

Also remember that both programs must start with the same dimension statements and have the same read and write addresses.

I think you'll find these routines useful. Now you can build your own Integer Basic programs to read and write data. □

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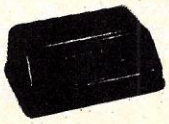

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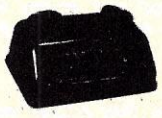

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CIRCLE 135 ON READER SERVICE CARD

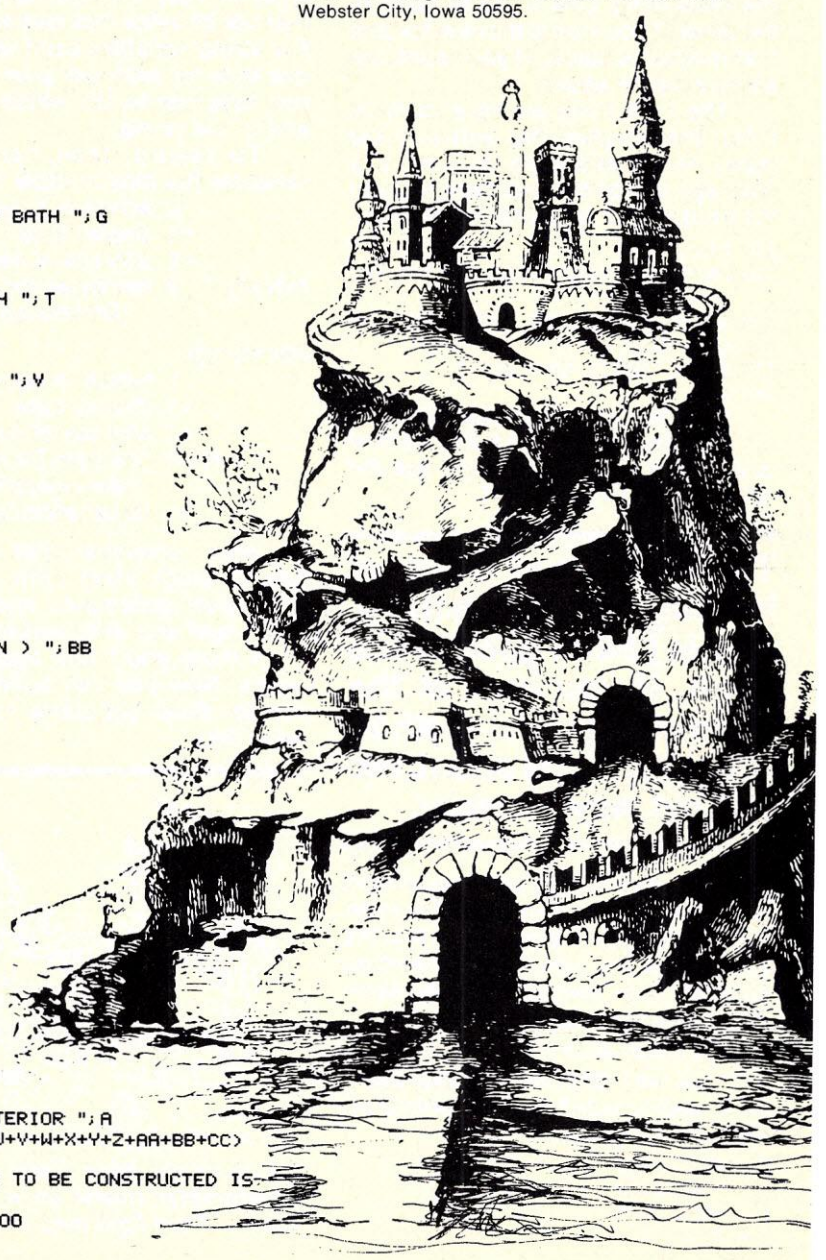
Home Construction Cost Estimate

John W. Essig

This program, written in TRS-80 Level II Basic, estimates the construction cost of a home based on the number of rooms, quality of construction, geographical area, and other factors. The programming is very straightforward, but you might want to improve it by adding yes/no answers or other factors. The sample run was printed using the screen-print feature of NEWDOS.

John W. Essig, 826 2nd Street, PO Box 366, Webster City, Iowa 50595.


```
1 REM.  HOME CONSTRUCTION COST ESTIMATOR.
2 REM.  THIS PROGRAM WILL GIVE A REALISTIC ESTIMATE OF THE COST
        TO BUILD THE MAJORITY OF THE SINGLE-FAMILY HOMES SEEN
3 REM.  IN THE USA TODAY.   A USER WHO IS CONSIDERING BUILDING
        A HOUSE MAY REPEAT IT WITH DIFFERENT COMBINATIONS OF
4 REM.  VARIABLES AND VERY QUICKLY DETERMINE IF HIS PLANS WILL
5 REM.  INSURANCE AGENTS WILL FIND IT USEFUL IN HELPING A CLIENT
        DECIDE HOW MUCH COVERAGE TO BUY ON A GIVEN HOUSE.
6 REM.  REAL ESTATE AGENTS MAY USE IT TO SHOW PROSPECTS WHAT IT
        WOULD COST TO DUPLICATE A HOUSE THEY ARE CONSIDERING.
7 REM.  LENDING OFFICERS AND APPRAISERS MAY USE IT TO GET A
        REPLACEMENT BASIS FOR USE IN ESTABLISHING VALUE.
8 REM.  AUTHOR: J ESSIG, BOX 366, WEBSTER CITY, IA 50595
9 CLS:CLEAR:RESTORE
10 PRINT "    ***  HOME CONSTRUCTION COST ESTIMATOR   ***"
15 PRINT " "
20 PRINT "      THIS PROGRAM WILL ASK YOU QUESTIONS ABOUT THE"
30 PRINT "HOME TO BE ESTIMATED.  ENTER YOUR ANSWERS BY TYPING"
40 PRINT "0 FOR NO, OR 1 FOR YES, AND THEN PRESS THE 'ENTER' KEY. "
55 PRINT " "
60 PRINT"**  REMEMBER  **   ZERO FOR NO  AND  1 FOR YES  **"
65 PRINT " "
70 PRINT "      THE PROGRAM ASSUMES THAT THE HOUSE HAS A KITCHEN,  A"
80 PRINT "LIVING ROOM, ONE FULL BATH AND TWO BEDROOMS PLUS THE OTHER"
90 PRINT "ROOMS IT WILL ASK YOU ABOUT.   IF IT IS SMALLER THAN THIS,"
100 PRINT "THE PROGRAM WILL BE UNABLE TO CALCULATE A COST FOR IT. "
115 PRINT " "
120 INPUT"IF YOU ARE READY TO GO, ENTER 1.   ARE YOU READY ";B$
125 IF B$ ="0" PRINT "END OF PROGRAM": END
130 CLS
140 PRINT "     1 = YES      0 = NO      "
145 PRINT " "
150 INPUT "DOES THE HOUSE HAVE A THIRD BEDROOM ";C
155 IF C = 0 GOTO 200
160 INPUT "A FOURTH BEDROOM ";D
165 IF D = 0 GOTO 200
170 INPUT "A FIFTH BEDROOM ";E
175 IF E = O GOTO 200
180 INPUT "A SIXTH BEDROOM ";F
185 IF F = 0 GOTO 200
200 CLS
201 INPUT "DOES THE HOUSE HAVE A 2ND FULL (3-FIXTURE) BATH ";G
202 IF G = 0 GOTO 220
210 INPUT "A THIRD FULL BATH ";H
217 PRINT " "
220 INPUT "DOES THE HOUSE HAVE A HALF (2-FIXTURE) BATH ";T
222 IF T = 0 GOTO 226
225 INPUT "DOES IT HAVE A SECOND 2-FIXTURE BATH ";U
226 CLS
227 INPUT"IS THERE SPACE IN THE KITCHEN FOR A DINETTE ";V
228 PRINT " "
229 INPUT"DOES THE HOUSE HAVE A DINING ROOM ";L
230 PRINT " "
232 INPUT "DOES IT HAVE A FAMILY ROOM ";M
235 PRINT " "
240 INPUT "A STUDY ";K
250 PRINT " "
255 INPUT "DOES IT HAVE A DEN ";J
257 PRINT " "
260 INPUT "A RECREATION OR RUMPUS ROOM ";N
262 CLS
265 PRINT " "
268 INPUT"IS THERE AN ATTIC (BIG ENOUGH TO STAND UP IN ) ";BB
269 IF BB = 0 GOTO 275
270 INPUT "IS THE ATTIC FINISHED ";P
275 PRINT " "
276 INPUT "IS THERE A BASEMENT ";CC
277 IF CC = 0 GOTO 280
279 INPUT "IS THE BASEMENT FINISHED ";O
280 PRINT " "
282 INPUT "IS THERE A MAIN-FLOOR UTILITY ROOM ";S
283 PRINT " "
285 INPUT "IS THERE AN ATTACHED GARAGE ";AA
290 IF AA = 0 GOTO 300
295 INPUT "IS THE ATTACHED GARAGE A TWO-CAR ";Q
300 CLS
305 INPUT "IS THE HOUSE CENTRALLY AIR-CONDITIONED ";R
307 PRINT " "
345 INPUT "IS THERE A DECK ";W
350 INPUT "IS THERE AN ENCLOSED PORCH ";X
352 PRINT " "
355 INPUT "IS THERE A FIREPLACE ";Y
360 IF Y = 0 GOTO 367
365 INPUT "IS THERE A SECOND FIREPLACE ";Z
367 PRINT " "
369 INPUT "IS THERE ANY BRICK OR STONE-WORK ON THE EXTERIOR ";A
370 DD = (5+A+C+D+E+F+G+H+J+K+L+M+N+R)+.5*(O+P+Q+S+T+U+V+W+X+Y+Z+AA+BB+CC)
    CLS
372 PRINT "THE AREA OF THE COUNTRY WHERE THE HOUSE IS TO BE CONSTRUCTED IS
    ALSO A FACTOR IN COST ESTIMATION.":PRINT" "
373 INPUT "WILL THIS HOUSE BE BUILT IN THE MID-WEST";OO
374 IF OO = 0 GOTO 376
```



```
375 LL = .96 : GOSUB 405
376 INPUT "WILL IT BE BUILT SOUTH OF THE MASON-DIXON LINE ";EE
377 IF EE = 0 GOTO 382
378 INPUT "IN EITHER LOUISIANA OR KENTUCKY ";EE
379 IF EE = 0 GOTO 381
380 LL=.93 : GOSUB 405
381 LL = .83 : GOSUB 405
382 INPUT "IN THE GREAT SOUTHWEST ";GG
384 IF GG = 0 GOTO 389
385 INPUT "IN CALIFORNIA ";GG
386 IF GG = 0 GOTO 388
387 LL = 1.11 : GOSUB 405
388 LL = .95 : GOSUB 405
389 INPUT "IN THE NORTHWESTERN U S ";II
390 IF II = 0 GOTO 392
391 LL = .91 : GOSUB 405
392 INPUT "IN THE NEW ENGLAND STATES ";JJ
393 IF JJ = 0 GOTO 397
395 LL = .96 : GOSUB 405
397 LL = .93
405 MM=DD*LL :CLS
407 PRINT "NEXT, IT IS NECESSARY TO RATE THE DESIGN"
410 PRINT "AND CONSTRUCTION ON A SCALE OF 1 TO 4."
412 PRINT " "
415 PRINT "GRADE 1: A SIMPLE HOUSE BUILT FROM STOCK PLANS."
422 PRINT " "
425 PRINT "GRADE 2: BUILT FROM STOCK OR DESIGNER PLANS"
430 PRINT "WITH AVERAGE OR BETTER MATERIALS."
432 PRINT " "
435 PRINT "GRADE 3: CUSTOM BUILT FROM DESIGNER PLANS"
440 PRINT "WITH MANY EXTRA FEATURES."
442 PRINT " "
445 PRINT "GRADE 4: ONE OF A KIND.  BUILT FOR AN"
450 PRINT "INDIVIDUAL UNDER AN ARCHITECT'S SUPERVISION."
452 PRINT " "
460 INPUT "PLEASE SPECIFY THE GRADE: 1,2,3 OR 4 ";FF
465 IF FF = 1 GOSUB 520
470 IF FF = 2 GOSUB 540
480 IF FF = 3 GOSUB 560
485 IF FF = 4 GOSUB 580
520 CLS
522 NN = MM * 3970
524 PRINT " "
525 PRINT "USING STOCK PLANS AND ECONOMY MATERIALS, WE "
527 PRINT "ESTIMATE THAT CONSTRUCTION COSTS FOR THIS HOME "
529 PRINT "WOULD TOTAL" USING "$$###,###.##";NN :GOSUB 600
540 CLS
542 NN = MM * 5024
545 PRINT "USING STOCK OR SIMPLE DESIGNER PLANS AND AVERAGE OR"
547 PRINT "BETTER MATERIALS AND WORKMANSHIP, WE ESTIMATE THAT"
551 PRINT "THE COST TO CONSTRUCT THE HOUSE YOU HAVE DESCRIBED"
554 PRINT "WOULD TOTAL" USING "$$####,###.##";NN :GOSUB 600
555 END
560 CLS : PRINT " "
562 NN = MM * 6164
565 PRINT "WE CALCULATE THAT THE CONSTRUCTION COST OF THIS"
567 PRINT "DESIGNER HOME (LOT & LANDSCAPING NOT INCLUDED)"
569 PRINT "WOULD BE" USING "$$####,###.##";NN
570 GOSUB 600
580 CLS: PRINT :PRINT"WE ESTIMATE THAT THE CONSTRUCTION COST OF THIS"
582 PRINT "UNIQUE HOME (LOT & LANDSCAPIING NOT INCLUDED)"
584 NN = MM * 7356
589 PRINT "WOULD BE" USING "$$####,###.##";NN :GOSUB 600
600 PRINT " "
602 PRINT "USING A CONSERVATIVE 6 % INFLATION FACTOR, THE"
606 PRINT "COST TO BUILD THIS HOUSE IN :"
610 PRINT "                              1981 WOULD BE"
      USING "$$####,###.##";1.06*NN
615 PRINT "                              1982 WOULD BE"
      USING "$$####,###.##";1.12*NN
620 PRINT "                              1983 WOULD BE"
      USING "$$####,###.##";1.19*NN
625 PRINT "                              1984 WOULD BE"
      USING "$$####,###.##";1.26*NN
630 PRINT "                              1985 WOULD BE"
      USING "$$####,###.##";1.34*NN
635 PRINT " "
640 PRINT " "
650 REM. AUTHOR:  J ESSIG, BOX 366, WEBSTER CITY, IA 50595
999 END
```

```
    ***  HOME CONSTRUCTION COST ESTIMATOR   ***

     THIS PROGRAM WILL ASK YOU QUESTIONS ABOUT THE
HOME TO BE ESTIMATED.  ENTER YOUR ANSWERS BY TYPING
0 FOR NO, OR 1 FOR YES, AND THEN PRESS THE 'ENTER' KEY.

**  REMEMBER  **   ZERO FOR NO  AND  1 FOR YES  **

     THE PROGRAM ASSUMES THAT THE HOUSE HAS A KITCHEN,  A
LIVING ROOM, ONE FULL BATH AND TWO BEDROOMS PLUS THE OTHER
ROOMS IT WILL ASK YOU ABOUT.  IF IT IS SMALLER THAN THIS,
THE PROGRAM WILL BE UNABLE TO CALCULATE A COST FOR IT.

IF YOU ARE READY TO GO, ENTER 1.  ARE YOU READY ? 1_


     1 = YES      0 = NO

DOES THE HOUSE HAVE A THIRD BEDROOM ? 1
A FOURTH BEDROOM ? 1
A FIFTH BEDROOM ? 1
A SIXTH BEDROOM ? 0_


DOES THE HOUSE HAVE A 2ND FULL (3-FIXTURE) BATH ? 1
A THIRD FULL BATH ? 0

DOES THE HOUSE HAVE A HALF (2-FIXTURE) BATH ? 1
DOES IT HAVE A SECOND 2-FIXTURE BATH ? 0_


IS THERE SPACE IN THE KITCHEN FOR A DINETTE ? 0

DOES THE HOUSE HAVE A DINING ROOM ? 1

DOES IT HAVE A FAMILY ROOM ? 0

A STUDY ? 1

DOES IT HAVE A DEN ? 0

A RECREATION OR RUMPUS ROOM ? 0_


     IS THERE AN ATTIC (BIG ENOUGH TO STAND UP IN ) ? 0

     IS THERE A BASEMENT ? 1
     IS THE BASEMENT FINISHED ? 1

     IS THERE A MAIN-FLOOR UTILITY ROOM ? 1

     IS THERE AN ATTACHED GARAGE ? 1
     IS THE ATTACHED GARAGE A TWO-CAR ? 1_


IS THE HOUSE CENTRALLY AIR-CONDITIONED ? 0

IS THERE A DECK ? 1
IS THERE AN ENCLOSED PORCH ? 0

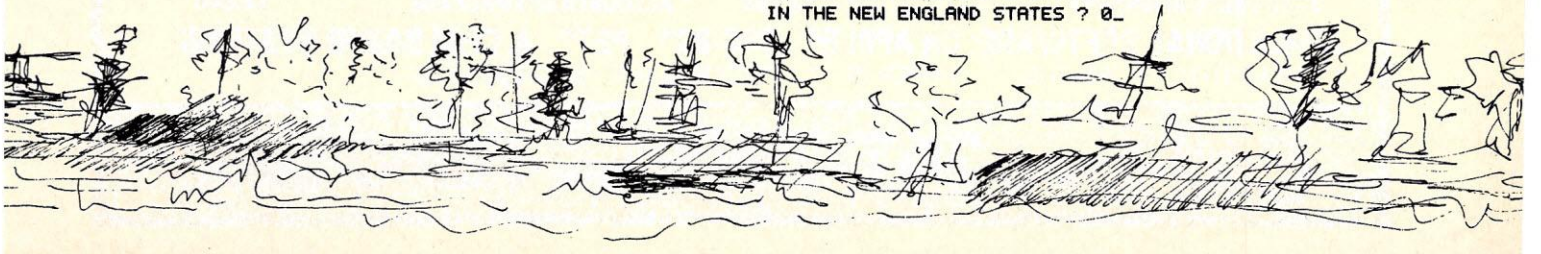
IS THERE A FIREPLACE ? 1
IS THERE A SECOND FIREPLACE ? 1

IS THERE ANY BRICK OR STONE-WORK ON THE EXTERIOR ? 0_

THE AREA OF THE COUNTRY WHERE THE HOUSE IS TO BE

    CONSTRUCTED IS ALSO A FACTOR IN COST ESTIMATION.

WILL THIS HOUSE BE BUILT IN THE MID-WEST? 0
WILL IT BE BUILT SOUTH OF THE MASON-DIXON LINE ? 0
IN THE GREAT SOUTHWEST ? 0
IN THE NORTHWESTERN U S ? 0
IN THE NEW ENGLAND STATES ? 0_
```



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CIRCLE 125 ON READER SERVICE CARD

Estimate, cont'd...

```
NEXT, IT IS NECESSARY TO RATE THE DESIGN
AND CONSTRUCTION ON A SCALE OF 1 TO 4.

GRADE 1: A SIMPLE HOUSE BUILT FROM STOCK PLANS.

GRADE 2: BUILT FROM STOCK OR DESIGNER PLANS
WITH AVERAGE OR BETTER MATERIALS.

GRADE 3: CUSTOM BUILT FROM DESIGNER PLANS
WITH MANY EXTRA FEATURES.

GRADE 4: ONE OF A KIND.  BUILT FOR AN
INDIVIDUAL UNDER AN ARCHITECT'S SUPERVISION.

PLEASE SPECIFY THE GRADE: 1,2,3 OR 4 ? 3_


WE CALCULATE THAT THE CONSTRUCTION COST OF THIS
DESIGNER HOME (LOT & LANDSCAPING NOT INCLUDED)
WOULD BE  $88,854.10

USING A CONSERVATIVE 6 % INFLATION FACTOR, THE
COST TO BUILD THIS HOUSE IN :
                    1981 WOULD BE  $94,185.30
                    1982 WOULD BE  $99,516.60
                    1983 WOULD BE $105,736.00
                    1984 WOULD BE $111,956.00
                    1985 WOULD BE $119,064.00
```

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CIRCLE 131 ON READER SERVICE CARD

Computer Store of the Month

ComputerLand of Cleveland

Almost every human endeavor imaginable has some application for computers. So it's not surprising that the people who find careers in computers enter the field with incredibly diverse backgrounds; the staff of ComputerLand of Cleveland is no exception. The enthusiastic crew of seven is comprised of a psychologist, an industrial engineer, two electrical engineers, a market analyst, a physicist and, last but not least, a computer engineer.

All staff members are knowledgable about the store's products, but their different backgrounds bring new pespectives to the tasks at hand. One employee used the resources of ComputerLand of Cleveland to help two high school students build a robot. Another designed and wrote a program central to a local television station's election coverage. When Cleveland's educational television station held a telethon recently, the staff joined together and donated an Apple Computer to the cause.

Although ComputerLand of Cleveland stocks a solid selection of personal and small business systems, the staff has never lost sight of the fact that they're not just "selling hardware". They offer advice and expertise to anyone attempting to size up the capabilities of different systems or assess their need for computer power. Each system sold includes an in-house training session for the computer's operator, as well as a three evening BASIC course. These BASIC courses are open to the public at a nominal charge.

If you're interested in taking a course or just stopping in to discuss building robots, locating Quarks or writing election analysis programs, you'll find ComputerLand of Cleveland at 1288 SOM Center Road, Mayfield Heights, Ohio 44124. The staff rotates between this location on Cleveland's east side and a second location on the west side. The store is open on Saturdays and has evening hours on Tuesdays and Thursdays. If you'd like, call ahead. Their telephone number is 216-441-1200.

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CIRCLE 189 ON READER SERVICE CARD

Four Play

Floyd M. Goldstein

Recently faced with the problem of making a schedule for a golf club, I wrote a short program to do the job. It creates a five-week schedule for 16 players, grouped in fours, with each playing only once with each other.

This five week schedule is repeated six times for the full 30 week period of the season; each plays with another six times.

The program can be used to make many different schedules (bridge, bowling, etc.) and can be modified to schedule almost any number of players (memory permitting).

The program was written for a TRS80 Level II (4k and up), but can be modified for many other computers. The PET verson requires almost no modifications. □

```
Golf Schedule (Floyd Goldstein   3-8-80)

5 CLS
8 PRINT @ 457,"*** PLEASE WAIT WHILE I MAKE THE SCHEDULE ***";
10 REM   : GOLF SCHEDULE FOR 16 PEOPLE ( 5 WEEKS )
15 REM   BY FLOYD GOLDSTEIN
             2498 MALIBU ROAD
             BELLMORE N.Y.  11710      MARCH 1,1980
20 CLEAR 250:DIM E(16,16),A$(4,5)
30 DEFSTR A-D:DEFINT I-M:RANDOM
31 FORI=1TO100:RANDOM:NEXT
35 REM  DEFSTR A-D SETS A-D AS STRING VARIABLES AND DEFINT SETS
        TO INTEGER   RANDOM RESEEDS THE RND# GENERATOR
40 A="ABCDEFGHIJKLMNOP":FORI=1TO16:E(I,I)=1:NEXT I:Q=1
50 FOR I=1 TO 5:B=A
70 FOR J1=1 TO 4:FOR J2=1 TO 4:  W=0
80 X=INT(RND(LEN(B))):IFX=0THEN80ELSEZ=ASC(MID$(B,X,1)):D=CHR$(Z)
90 W=W+1:IF W=100 THEN GOTO 240
95 PRINT @ 857,I;J1;J2;
100 Z=Z-64
110 FOR L=1 TO LEN(C):IF C="" THEN 140
120 IF E(Z,(ASC(MID$(C,L,1)))-64)>=Q THEN GOTO 80
130 NEXT L
140 C=C+D
141 B=LEFT$(B,X-1)+RIGHT$(B,LEN(B)-X)
150 IF LEN(C)=4 THEN 160 ELSE NEXT J2
160 FOR L=1 TO 4:Z=(ASC(MID$(C$,L,1)))-64
170 FOR M=1 TO 4:Y=(ASC(MID$(C$,M,1)))-64
180 E(Z,Y)=E(Z,Y)+1
190 NEXT M:NEXT L
200 FOR T=1 TO 4:A(J1,I)=A(J1,I)+MID$(C,T,1)+" ":NEXT T:C=""
210 NEXT J1:NEXT I
211 CLS
212 PRINTTAB(15)"*** GOLF SCHEDULE FOR 5 WEEKS ***"
213 PRINT STRING$(63,"-")
215 FOR I=1 TO 5:PRINT "   WEEK #" ; I ; ":  ";
220 FOR M=1 TO 4:PRINT A(M,I)"   ";:NEXT M:PRINT
230 NEXT I
231 PRINT:PRINT"  PLEASE COPY THE ABOVE DOWN . ":PRINT:INPUT"
DO YOU WISH TO MAKE ANOTHER 5 WEEKS";A$:IF LEFT$(A$,1)="Y" THEN RUN
235 END
240 PRINT @ 727," ** RESTART **";:FOR Y=1 TO 500:NEXT Y:RUN
```

Floyd M. Goldstein, 2498 Malibu Road, Bellmore, NY 11710.

SAMPLE RUNS :

```
            *** GOLF SCHEDULE FOR 5 WEEKS ***
-------------------------------------------------------------
  WEEK # 1 :  L M H C    E J O D    P B K N    I A G F
  WEEK # 2 :  M J N G    E B L F    K O I C    A H P D
  WEEK # 3 :  O P G L    M F D K    H J I B    N E C A
  WEEK # 4 :  O H F N    L K A J    D B C G    M P E I
  WEEK # 5 :  O B M A    G K H E    J C F P    L N I D


            *** GOLF SCHEDULE FOR 5 WEEKS ***
-------------------------------------------------------------
  WEEK # 1 :  J A H D    K F C B    L N M G    P O E I
  WEEK # 2 :  M K O J    H E F L    C D N I    A P B G
  WEEK # 3 :  O B H N    F I M A    E J G C    D P L K
  WEEK # 4 :  A O C L    F J P N    G H I K    D M B E
  WEEK # 5 :  C P M H    G D F O    K N E A    B I L J


            *** GOLF SCHEDULE FOR 5 WEEKS ***
-------------------------------------------------------------
  WEEK # 1 :  K L A F    P B I G    J C H N    E O D M
  WEEK # 2 :  O N F B    L M P J    C G A E    H I D K
  WEEK # 3 :  B M C K    G N D L    E F I J    P H O A
  WEEK # 4 :  L E B H    F C D P    J K G O    A M I N
  WEEK # 5 :  P N E K    I C O L    J B D A    F G M H


            *** GOLF SCHEDULE FOR 5 WEEKS ***
-------------------------------------------------------------
  WEEK # 1 :  N D C O    A K E I    M B F G    H L J P
  WEEK # 2 :  C G A L    O F H E    D M I P    K N J B
  WEEK # 3 :  J M C E    H K D G    O A P B    F I N L
  WEEK # 4 :  D E B L    H M N A    C K F P    I G O J
  WEEK # 5 :  J F A D    B H I C    G E N P    K M O L


            *** GOLF SCHEDULE FOR 5 WEEKS ***
-------------------------------------------------------------
  WEEK # 1 :  E B G L    I H D F    C O N K    A M P J
  WEEK # 2 :  K L J H    C P D G    E M N F    B I O A
  WEEK # 3 :  M G I K    B D N J    O P H E    F A C L
  WEEK # 4 :  N P L I    B H M C    K D A E    G O F J
  WEEK # 5 :  K P B F    M O L D    C I J E    H N G A


notes :

line # 31 is not needed
To output to a printer, change the print to lprint
on line #'s  212, 213, 215, & 220
aside from that I think the program speaks for itself.


P. S.  PRINTED ON A CENTRONICS 530 AT 1200 BAUD
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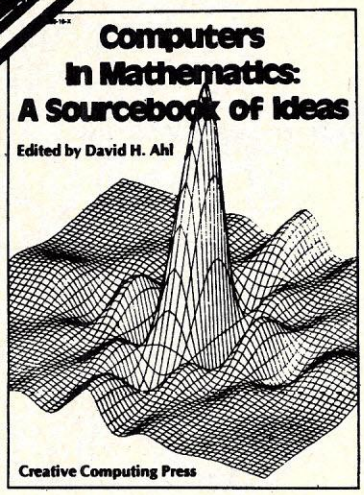

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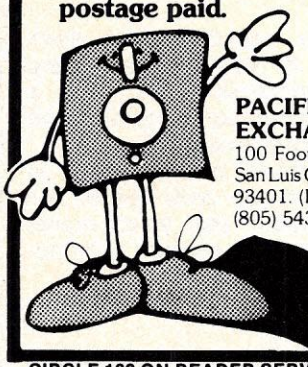
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MAY PROBLEMS SOLVED

David H. Ahl

P.S.–HEARD THIS ONE?

Of the several solutions received, the one from Joe Martin Free (Howard Industries, Inc., P.O. Box 1588, Laurel, MS 39440) was the most interesting in that he programmed it in the EDX language for an IBM Series/1. Space does not permit us to reproduce the program, however, here is Joe's logical approach.

From P's first statement, it is obvious that both of the integers cannot be prime.

From S's first statement, we know that of all the pairs of integers that can be added together to get this sum, no pair is such that both integers are prime numbers.

From P's last statement, we know that of all of the pairs of integers that are factors of the product, one and only one pair of integers exist such that the above conditions are true.

FOR EXAMPLE

Assume that P knew that the product was 92 and that S knew that the sum was 17.

P's 1st statement would be true because the factors could be $2 \times 26 = 52$ or $4 \times 13 = 52$.

Possible integers for the sum could be
$2 + 15 = 17$ $3 + 14 = 17$ $4 + 13 = 17$
$5 + 12 = 17$ $6 + 11 = 17$ $7 + 10 = 17$
$8 + 9 = 17$

Note that of all possible choices above, no pair is such that both integers are prime, so S could state that he knew that P did not know the answer.

From this P knows that if the integers were 2 and 26, S could not have made this statement because the sum would have been 28 which could be the sum of 5 and 23. Both 5 and 23 are prime numbers and S could not have known that P did not know the answer.

So P knows that the integers are 4 and 13.

After checking all of his possible choices that can sum to 17, S knows that only 4 and 13 are the integers such that P can make the deduction that he made.

His program to "prove" this solution follows these steps:

1. Create an array of numbers from 1 to 100 and eliminate the primes.

2. Fill a sum array with numbers (1 to 200) and eliminate any sum that can be the sum of any two primes.

3. For remaining sums, determine all possible sets of two integers that can produce it. For each set of integers, find the product. Then find all sets of two integers that can be a factor of this product. Find the sum of each set of factors. Each sum that is also in the sum array is an answer to the problem.

Moving the limit up to 200, Joe finds that the answers of 4 and 13 are still unique. He suspects it may be unique no matter what the upper limit, but declines the opportunity to prove it.

THE REMAINDERS

Several readers pointed out that there is more than one possible answer to this problem — 5,802,397 answers to be exact. Marathon "REXON" of Fairfield, N.J. wrote that all the answers are of the form:

$(N * 2520) - 1$

Where N is any integer from 1 to 5,802,397. Ian MacDonald of Stellarton, Nova Scotia came to the same conclusion and computed 2519 as the smallest answer with 14,622,042,959 as the largest.

HOT DESERT SANDS

It may be easier to solve this problem by visualizing the desert as 800 miles across and our truck as being able to carry 40 gallons of gas which will take it 400 miles. If you draw little pictures, you can see that the truck can go 100 miles, drop 20 gallons and return. The next trip is 200 miles. Continuing this process until 40 gallons are dropped at the halfway point for the final trip across yields a solution of 680 gallons or 17 tankfuls and total mileage of 6800 or the equivalent of 8½ trips across. Perhaps a trailer would be a better solution.

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puzzles & problems

A Remarkable Coincidence

Merlin has reached back to the time of World War II for this month's kickoff puzzle. Around 1944 a remarkable statistical coincidence was noted by some obscure cataloger of trivia. According to the table he compiled, five of the world leaders at that time had a great deal in common. Look at the following table and decide whether it was coincidence, or, a trick with numbers.

	Roosevelt	Churchill	Stalin	Hitler	Mussolini
Born	1882	1874	1879	1889	1883
Age (in 1944)	62	70	65	55	61
Took Office	1933	1940	1922	1933	1922
Years in office	11	4	22	11	22
Total	3888	3888	3888	3888	3888

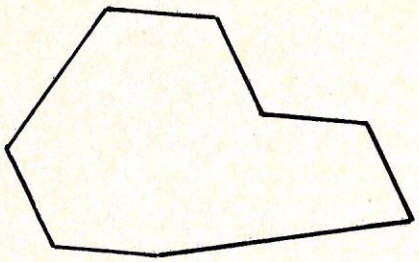
The Correct Combination

Here's an interesting problem from Mr. L. E. Schander of Yorktown, Virginia. Mr. Schander will receive a copy of "Merlin's Puzzler II" for his contribution. The problem is stated thusly:

"My boss was working late one evening and found he had to get a very important file out of my safe which was sealed by a three-number combination lock. He called me up at home, and since it is against company policy to reveal combination lock numbers over the phone, I gave him only the following hints:"

"If you add 1 to the first number, 2 to the second number, and subtract 17 from the third, the product of the new numbers is one larger than the product of the original set. (That is: $A \times B \times C + 1 = (A + 1) \times (B + 2) \times (C - 17)$). If you add 1 more to the first number, and add 2 more to the second, and subtract 7 more from the third, the new product will again increase by 1 and you will know the correct combination."

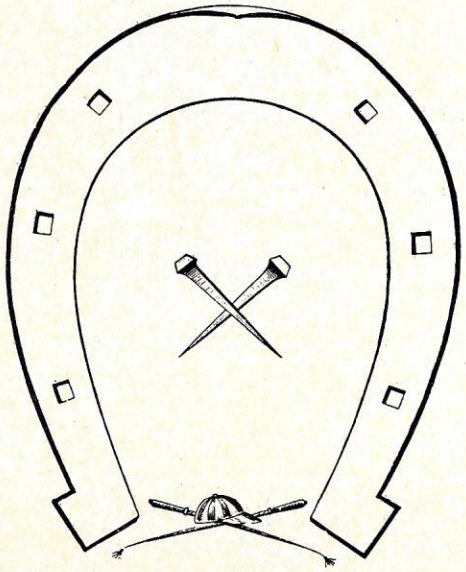
"Now, what are the combination lock numbers?"

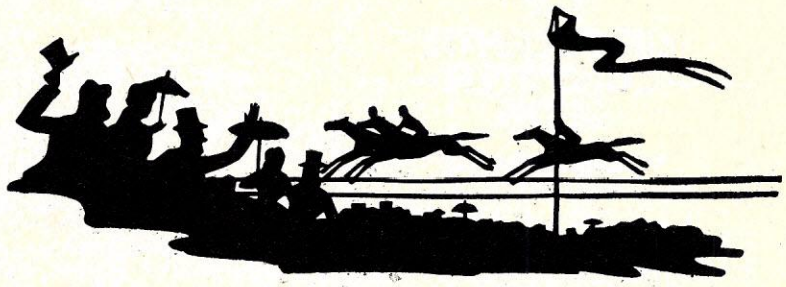


A Problem In Division

According to Merlin the next easy (?) puzzle should take you no more than three minutes to solve. You are to divide the irregular shape depicted here into three equal parts by drawing just two straight lines across it. On your mark, get set, go!

A Betting Proposition



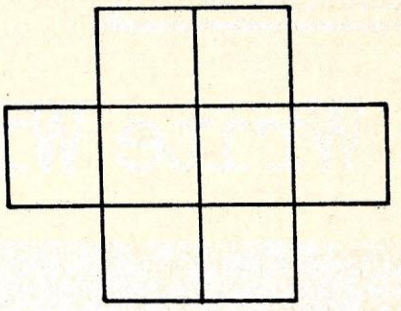


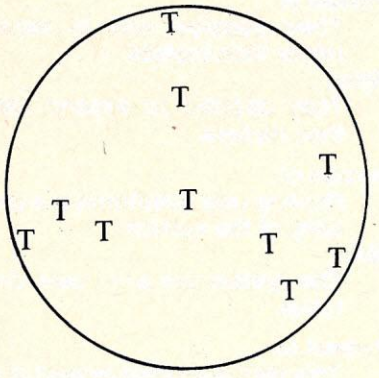
Tallyho, old sport, here's a puzzle you should get a kick out of. Orville Wheelwright, the blacksmith out at the Merlin Downs racecourse, fooled everyone for years with this puzzle. He would hand you a horseshoe which contained six nail holes and ask you to divide it into six pieces, each piece having one of the nail holes in it. You were allowed to make only two straight-line cuts across the horseshoe with a hacksaw to accomplish this feat. Does anyone here care to wager on this one?

(From "Merlin's Puzzler III")

A Touching Problem

From "The Sometimes Baffled Computer Services Dept." at the Homewood/Flossmoor High School in Flossmoor, Illinois, we have a nice little puzzle. All you have to do is arrange the numbers 1 through 8 in the boxes at the right so that no two consecutive numbers are next to each other (up-down, left-right, or diagonally). A copy of "Merlin's Puzzler 1" is on the way to Gail, Ruth, Earnistine, Gary, and Pete.





The Puzzle Of The Ten Tigers

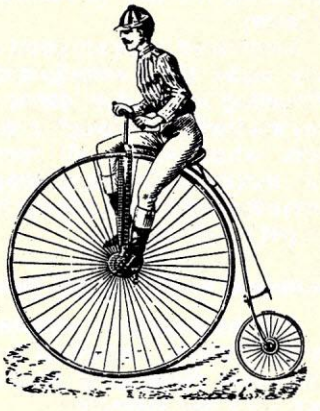
Sherlock Holmes, Dr. Watson and Inspector Lestrade were returning to London by train. To pass the time they had been swapping puzzles.

"Now gentlemen," said Holmes, "as we have time for one more puzzle I think I will acquaint you with a problem I call "The Puzzle of The Ten Tigers." The puzzle states that the London Zoo, after having been given ten tigers, had then placed all together in a circular cage. Next, they wished to erect three circular fences within this cage in such a way that each tiger would be isolated from every other tiger. The fences could cross each other at any point. I'll give you both until we arrive at Paddington Station to solve this puzzle."

(From "Merlin's Puzzler 1").

The Bicycle Puzzle

Henry and Harriet decided to bicycle up to Morristown and visit the headquarters of Creative Computing. The distance they had to travel was 20 miles. After they had covered four miles Henry's bike broke down and he had to chain it to a tree. Being in a hurry they decided to push on as quickly as they could. They had the choice of both walking, or, of one walking and one riding the remaining bike. They both can walk at the rate of four miles an hour and ride at eight miles an hour. They decided on a plan of action that would keep their walking to a minimum and yet would get them to Morristown in the shortest amount of time. What combination of walking and riding did they use?



Dropped-Letter Proverbs

Supply the missing letters, and each of the series following will be found to represent a popular proverb. Each dash represents either a dropped letter or the space between two words. In some of the examples one dash stands for two dropped letters.

1. F-i-t-h-a-t-e-e-w-n-a-r-a-y.
2. B-r-s-f-f-t-r-f-c-t-g-t-r.
3. H-w-o-g-s-b-r-w-g-g-s-s-r-w-g.
4. T-k-c-r-f-h-p-n-n-t-e-p-n-s-w-l-t-k-c-r-f-t-e-s-l-s.

(From "Merlin's Puzzler 2").

A Puzzle With Coins

Required, to arrange twelve coins in such manner that they shall count four in a straight line in seven different directions.

If you have a favorite puzzle that you would like to share with the readers of Creative Computing send it in, and, if Merlin uses it he will send you a copy of one of his "Merlin's Puzzler" books. Until next time, your editor, Charles Barry Townsend.

Edmond H. Weiss, Ph.D.

Write With Verbs

Edmond H. Weiss, a communications consultant, teaches effective writing seminars for business, industry, and government. To contact him, call 609-795-5580.

Effective writers use the right verbs. (Notice: I didn't say *utilize.)* With good verbs you can lighten your text, brighten your reports, focus your ideas, engage your readers, push your proposals, command your technicians . . . you get the idea.

But most technical people in general, and computer people in particular, write with extra nouns instead of verbs. (Further, the few verbs they do use are often stiff and dull — like *utilize.)*

Editors have many names for this tendency to write in nouns. Some, as you would expect, call it *nominalization* (a horrible word!). Others call it *smothering the verb* (a name more to my taste).

Smothered verbs are good, strong, lively verbs that, unfortunately, are suffocating inside dull, dense nouns. They are harmless enough in your first drafts, when you're still composing your thoughts. But they should not survive the first draft. Look out for them and get rid of them.

Smothered Verbs: Garden Variety

The most typical smothered verbs are in phrases beginning with the words *have, make, give, reach* and *do.* Here are a few examples:

Smothered	*Breathing*
have an objection	object
have knowledge	know
have reservations	doubt
have a suspicion	suspect
make a distinction	distinguish
make a suggestion	suggest
give an answer	answer
give a justification	justify
reach a conclusion	conclude
reach an end	finish, end
do an inspection	inspect
do a draft	draft

In most — not all — cases, the phrase on the left should be replaced with the word on the right. Instead of:

We did not *have sufficient knowledge* of the problem to *make a suggestion* for improvements.

Write:

We did not *know* enough about the problem to *suggest* improvements.

Instead of:

They cannot *do a verification* of the data until you *make a decision* about the new password.

Write:

They cannot *verify* the data until you *decide* about the new password.

Smothered Verbs: More Exotic Varieties

Technical people, it seems, are endlessly resourceful in inventing new smothered verbs. Among the more curious I've had to edit recently are:

Smothered	*Breathing*
furnished an explanation	explained
effectuate a system startup	start up the system
achieve linkage	link
accomplish a separation	separate
realize an improvement	improve
generate a solution	solve
effect a replacement	replace

So, instead of:

The *calculations of costs are accomplished* by the TREND model.

Write:

The TREND model *calculates* the costs.

Instead of:

Separation of the personnel and payroll files *was achieved.*

Write:

The personnel and payroll files *were separated.*

Instead of:

Rectangle *formation can be realized* in three ways.

Write:

You *can form* rectangles three ways.

Verbs Disguised as Nouns

Always be alert to any verbs, smothered or not, disguised as nouns. Usually, the suspect noun will end with the letters *ion,* or *ing,* or *ment.*

Instead of:

Their *decision* was to expand, rather than replace.

Write:

They *decided* to expand rather than replace.

Instead of:

Printing user directories is a capability of the system.

Write:

The system *can print* user directories.

Instead of:

This plan is an *enlargement* of our earlier objectives.

Write:

This plan *enlarges on* our earlier objectives.

Why Do Verbs Matter So Much?

As you can see, finding and using the right verb makes a sentence shorter and "cleaner," without sacrificing information. With fewer and shorter words, the sentences read more easily and invite fewer errors.

The only objection I sometimes hear to writing with verbs is that it makes the sentences *too* readable. They sound too much like ordinary English and not enough like "documentation." If you find yourself liking the "before" sentences better than the "after" sentences, because they sound more "formal," you may be confusing formality with pompousness.

Writers who are embarrassed or unsure will sometimes hide behind these stuffy nouns. They will write, "We have insufficient knowledge . . ." instead of "We don't know." Or they will write, "No decision has been reached as of yet . . ." instead of "We still have not decided."

For the most part, though, writing with too many nouns is just a bad habit of style: something we pick up from the gang at work. To rid yourself of the habit, inspect your first drafts for offending phrases like the examples above. If you correct enough of them, you may one day reach a point where your writing is not only free of errors, but also — dare I say it — fun to read.

Next time: Showing Off □

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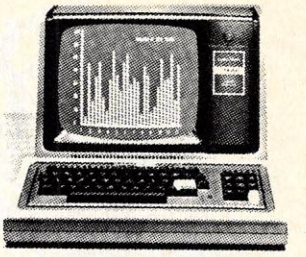

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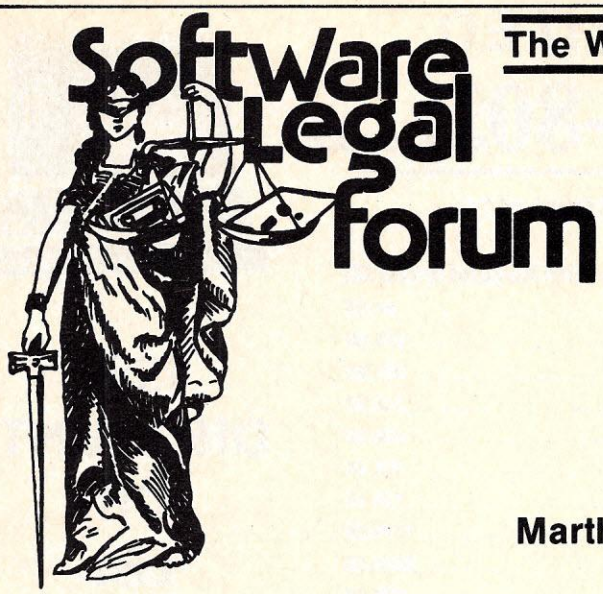


The Wonderful World of Copyright Confusion

The comments and opinions of the author are given for educational purposes only and are not meant to be legal advice. Specific legal questions should be referred to your personal attorney.

"When I use a word," Humpty Dumpty said, " . . . it means just what I choose it to mean — neither more nor less."
Lewis Carroll
Through The Looking Glass

Martha R. Gore

What do the words "copyright" and "copyright infringement" mean to you?

If you have ever written or thought about modifying or developing software using your own or your employer's computer, these could be two of the most important words in your vocabulary. Although the words have been defined in legalese (Software Legal Forum, Jan '80), even lawyers do not always agree as to the application of the legal definitions. Recently, at a software legal seminar sponsored by a university computer center, an attorney opened the discussion by telling his audience, "Please don't quote me or think you can use what I am going to say in your own situation."

His point was that every particular problem has its own elements that must be considered when applying the new Copyright Law. The legal treatment must be tailored to the specific circumstance. And the name of the game is prevention of legal problems before they arise. Once into an after-the-fact controversy, there is going to be a lot of mental anguish and expense.

As the use of small computers becomes more common, the pressure for increased production of software multiplies. The result is that the technology is greatly exceeding the legal system's ability to handle its complexities. Eventually, the courts make the necessary decisions, but until that time, the creators of software have to depend upon lawyers who are still debating what constitutes reproduction limitations and copyright infringemets.

The present copyright law equates software with literary work. A person can take a whole group of words and combine them, creating an original work. Where the rub comes in is that in software, many of the programs have a good number of similarities.

According to some legal opinions, if the work has a spark of originality, it is copyrightable. The combination may be all old stuff, but it has been combined in a new way. Although other elements have plugged into it, it is still something unique. The assumption is that the basic material is out there in the universe, and since the creator packaged it and made the machine do something different, it is a new creation.

On the other hand, some lawyers may consider such a new combination, even though copyrightable, to be a derivation of a prior work and, thus, a copyright infringement. Their argument is that the law defines a derivative work as something which is based upon pre-existing work and includes such things as revisions, annotations, elaborations, modifications, etc.

Is there a way to determine at what point someone else's work has been copied and at what point the program becomes original? It is a very difficult threshold to define. Distinguishing the new from the old is where copyright infringement lawsuits come from.

For this reason, anyone involved with software writing or modification needs a good copyright attorney to lead him or her through the maze. Right from the beginning, it is important to level with your attorney. The attorney's job is to determine whether the work has enough originality to be copyrightable and he or she must know what elements were knowingly taken from the work of others. There must be enough knowledge about the differences and enough expertise using it to show that the work is original. The first line of defense in a lawsuit is documentation availability to help the lawyer prove his case.

If the lawyer decides that it is copyrightable, there should be no delay registering the copyright claim. The Library of Congress Copyright Office can supply information and the proper forms.

Copyright applications should be keyed to the first time the program ran and worked. The registration is a record of the claim, notice to the world that the claimant created the work and controls the rights to it. The whole purpose of the copyright law is to protect and support the originator's right to earn something from his creative activity.

Under the new law, as soon as the new program is put in some permanent medium, it is automatically copyrighted. The copyright then provides the originator with some legally protectable right which can then be offered to the marketplace.

A lawyer should be the one to either draw up a contract or provide insight if the contract is submitted by the buyer. One attorney should never represent both parties to a contract.

The deal can include the sale of all rights, and the seller can take his money and run. That gives the buyer complete control of the product and its use. Or the creator can market copies of the work himself, either selling or leasing the package.

Actually, in the real world, the fact that the work has been copyrighted is just the beginning of the battle. An original work can quickly become common usage if there is no effort made to protect it. There is a lot of stuff floating around now that was once exclusively owed, but the originator lost control of it. If the creator looks the other way for a long enough time, allowing the material to be used with-

out permission, the rights to it can be lost.

Another pitfall is that on-lookers or minor participants in a project will copyright the work. It is a good idea to have some kind of an agreement with anyone involved at any stage of development.

The plain fact of the matter is that software is very difficult to protect, just because it is in machines and accessible to anyone who sees the output. There are many folks who can look at the output, figure out how to make a few changes and call it something new. It is not unusual for someone to modify a program which has been developed for one machine so that it will run on another. New companies have been started by someone working on a university computer on a weekend, figuring out what was in the computer, modifying it and then going into business for himself.

The course of events can really become complicated when an employee works up a project on his employer's computer or time, or writes a program at home, but gives it a trial run at work. This can be especially sticky if an employee has been hired as a programmer or to make the company's computer do things better. If one is paid to do any kind of creative work, there may be an obligation to share income from outside activity with employers.

The attitude of many employers is that employees are paid to be creative and that outside creativity is a result of their employment. Their thinking is that machines paid for with company money are being used to educate employees, and anything being produced because of that knowledge should be shared with them.

It would appear that unless there is a specific agreement which spells out ownership rights, even if the material is produced elsewhere, employees should get some good advice before tinkering around.

Right now, university computer centers are taking a lot of interest in work that is being created at their expense. Now that there is growing pressure for professors to computerize classroom work, such as problem solving, etc., someone is going to make a lot of money putting this information into machines.

When lessons are composed by the teacher or professor, become a program through the expertise of someone who knows how to make the computer work, and the program is developed in the universities' computer centers, there are going to be some interesting legal questions to resolve regarding legal ownership of the finished product and the relative rights of those who played a part.

Both business and academia are beginning to assert their rights, insisting that their hard cash is involved in any work which comes out of their shops. If something is invented or created within their facilities, they are demanding part of the action.

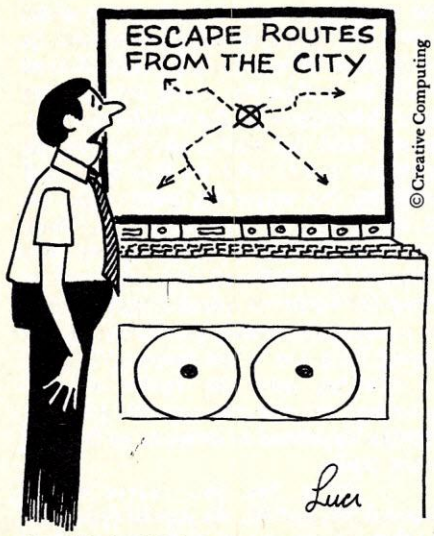
An employee or student needs to know exactly what his or her responsibilities and obligations are to the party who furnishes the machines and materials.

If an employee-employer contract has already been signed, an attorney should read the fine print. There may be some surprises in store for the employee.

When considering employment, discuss any restrictions in order to avoid misunderstandings at a later date. Employers have been known to claim that knowledge gained on the job provided the impetus for personal software creativity or that new programs were created from elements of software that had been paid for by the company.

Often, the employing business institution or university has an attorney who can spell out restrictions on outside activity that are contained in the employment contract. However, an independent lawyer should be consulted if the employee or student has any questions about past or future work in order to avoid a conflict of interests.

The final determination as to the limitations of the copyright law will eventually emerge through court tests. Until that time, anyone involved with small computers and software, in any capacity, will have to depend upon individual attorney's interpretations and hope that he is right. □



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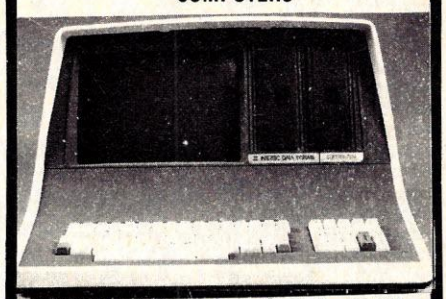

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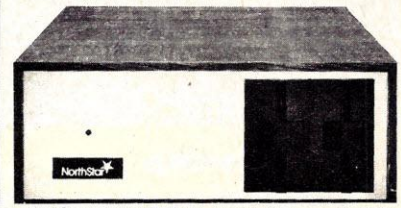

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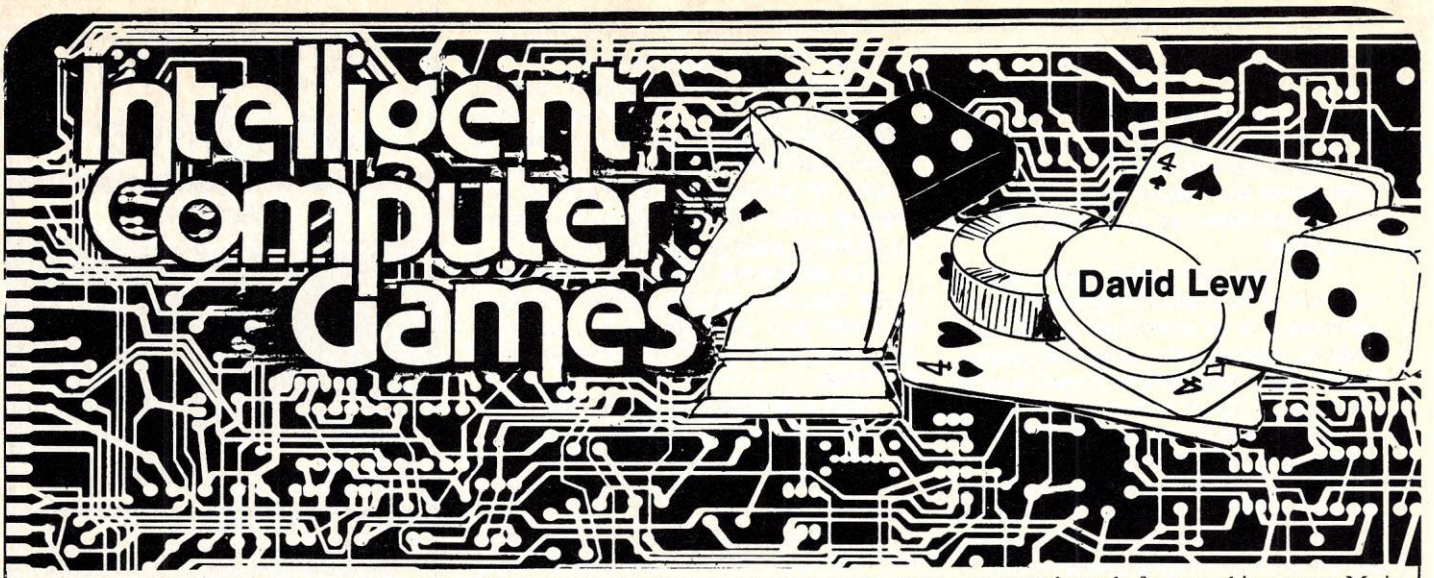


David Levy

Correspondence is welcome. Letters with interesting questions and ideas will be used in the column along with a response. No personal replies can be made. Send to: David Levy, 104 Hamilton Terrace, London NW8 9UP, England

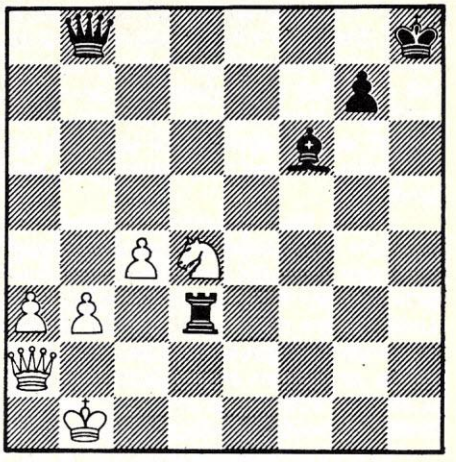
Bluffing And Psychology

It may sound strange to suggest that a deterministic animal such as a computer is capable of performing in a psychologically motivated manner, but those of us who believe that Artificial Intelligence is here to stay will argue that if *you* can do it, so can a computer (or small computer) program. This month's article is devoted to a discussion of the ways in which the 'thought' processes of a game playing program may be modified to perform in a manner that takes advantage of its opponent's psychological makeup.

Michie's Work

I have referred, in an earlier article, to Donald Michie's paper *A Theory of Evaluative Comments in Chess.* In this paper, Michie makes use of the fact that in a two-person game tree, it is not absolutely accurate to assume that the opponent will always make the best move at his disposal. Players are liable to make mistakes, and Michie's paper is centèred around this fallability. A strong player, in chess or any other game, will often encounter a situation in which the best move, based purely on deterministic considerations, is not the move most likely to maximize a player's chance of success. Let us consider a concrete example which I witnessed in an international chess tournament.

The position was something like this. Both players had been very short of time and had been making their moves at great speed. White is clearly losing, and had his opponent not been in time trouble he



would probably have resigned. But White tried one last chance. He played 1 Qa2-h2, giving check. The first thing that I should mention is that these two players were using a very large chess board and set. This had a bearing on White's plan, because he hoped that his opponent's gaze would be attracted to the black king, and that he would not notice the fact that the queen, way over on the other side of the board, was attacked by and attacking the white queen. Had black not noticed this fact, he would have moved his king and allowed White to capture his queen on the next move, whereupon White would have won. In fact Black did notice, and knowing his opponent rather well he had been half expecting this surprising queen check on h2, so, without a moment's pause, Black captured the White queen and our hero resigned. He had not lost anything by trying the ludicrous queen check, because his position was totally lost. He was merely hoping for a one in ten thousand chance.

Moving into the realm of tree searching, we shall now consider a similar example expressed in terms more familiar to the reader.

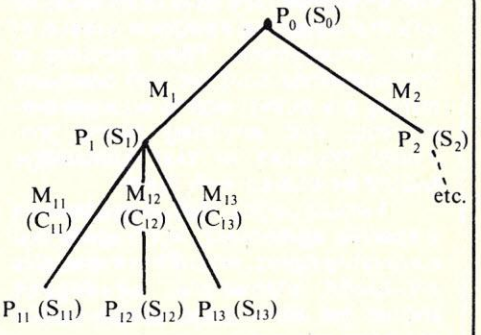
A player has two moves at his disposal, M_1 and M_2. He is good enough to see that if he makes move M_1 the result of the game will inevitably be a draw. So the expected result from making move M_1 is 0.5.

If he makes move M_2 the player sees that his opponent can defeat him, but only by finding a 15-ply deep continuation that is very difficult to spot. Otherwise, our player will win. He assesses the probability of his opponent finding this 15-ply win as being 0.1. The expected result from making move M_2 is therefore

$$(0.1 \times 0) + (0.9 \times 1) = 0.9$$

So even though, with correct play, M_1 is theoretically better than M_2, our player will be better off making move M_2.

Michie analyzes his tree in the following manner (I am using a simpler example):



Let us assume that we are growing a 2-ply tree, with terminal positions P_{11}, P_{12} and P_{13} . . . etc., and terminal scores S_{11}, S_{12} and S_{13} . . . etc., respectively. The program considers its possible move from the root position P_0 to P_1, and notes that its opponent will then have the choice of making the moves M_{11}, M_{12} and M_{13}. Let us say that the program estimates the chance (or probability) of its opponent making move M_{11} to be C_{11}, the chance of its opponent choosing M_{12} to be C_{12}, and the chance of move M_{13} to be C_{13}. Then instead of assigning to position P^1 a score of S_1 which is the *minimum* of S_{11}, S_{12} and S_{13}, the program assigns a value of

$$S_1 = (C_{11} \times S_{11}) + (C_{12} \times S_{12}) + (C_{13} \times S_{13})$$

and it is this score which is backed-up to P^0 (remember that the program, which

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"thinks" at even depths, will always make the move with the highest expected score).

This part of Michie's method will work perfectly well for a normal minimax search, but in an alpha-beta search there is the problem that a large number of branches are pruned from the tree so an accurate, backed-up expected score is impossible to achieve. Possibly one could attempt an approximation for alpha-beta searching, but this could lead to extremely unreliable results if the pruning was effective and only a small number of branches examined before a cutoff move found at each (or many) nodes.

Discernability

Consider the plight of an imperfect player trying to decide which move to make in a game. There are three aspects of his situation that may affect his decision:

1. How strong a player is he? If he is very strong then he will nearly always make the best move. If he is very weak then he will often make the wrong one.

2. How obvious is the right move? If you and I are playing chess, and you capture my queen, it is fairly obvious, even to a weak player, that I must recapture your queen unless there is something special about the position. In a "quiet" position, in which neither side has any direct threats or simple captures, the correct move is far more difficult to perceive, because there may be a number of moves of roughly equal merit.

3. What extraneous (psychological!?) factors affect the decision? If the correct move is a queen move and our player suffers from some peculiar sexual fantasy that precludes certain types of queen move, it is likely that he will fail to play the correct move.

These three factors combine to affect discernability — the ease of finding the right move. Michie has devised the following model for discernability in chess:

$$d = (M + 1)^{\frac{3(r+3)}{(r+e)}}$$

where M is the player's rating in kilopoints on the international rating scale. (Bobby Fischer's M is roughly 2.8, David Levy's is 2.3, the average of all those who can play chess is 0.8.)

r is the number of ply that a terminal evaluation has been backed up.

e is a small number chosen to avoid the expression becoming infinite for r=0.

Michie's formula is derived from the fact that discernability is directly related to playing strength and inversely related to the number of plausible or possible moves ("plausible" being a function of playing strength). He further argues that the probability of a player whose discernability is d, making a move leading to an expected score of u, will be given by

$$p\alpha^{du}$$

Using these expressions, it would be possible for a strong chess program to plan its play according to the rating of its opponent; taking greater risks against weaker opponents and being cautious against strong ones. At the start of a game it would need to be told its opponent's rating, or if it were extremely sophisticated it could estimate its opponent's strength by performing regression analysis on the moves he made as the game progressed, thereby enabling it to update its estimate of his rating on a move-by-move basis.

How to Psych Your Opponent

A good player will sometimes use psychology to help him win games. He will make moves that are probably not the very best, but which will be difficult or unpleasant for his particular opponent to meet. In chess, for example, a player who is equally at home in quiet, clear positions or in sharp, tactical skirmishes, will himself choose quiet play against a tactical genius but sharp moves against a quiet player. How can this be achieved by a computer program, particularly when employing an alpha-beta search?

Let us assume that the program examines every 1-ply position with a search that analyzes only captures and checks. If the program counts the number of moves examined in each of these capture searches, it can compute a measure for the complexity or "turbulence" of the 1-ply position. This measure might be some fraction of the logarithm of the number of positions in the capture search. The program can then add this turbulence score to the 1-ply position so that when conducting the full tree-search the program assigns greater scores to the moves that lead to more complex positions, which in turn will encourage the program to head for this type of position. If the program's opponent dislikes "quiet" positions, the program should subtract the turbulence measure, thereby encouraging it to play into quiet positions. It would even be possible for the program to psychoanalyze its opponent during a game, by measuring his tendency to head for quiet or complex situations. It could then act accordingly, avoiding positions that suited its opponent's style of play, and aiming for positions that would be less pleasant for the opponent to face.

Bluffing

Anyone who has played cards a lot will know that it is sometimes necessary to bluff. In certain games bluffing is quite rare, in others it is fairly common, in some it is frequently essential. Here we shall discuss two different types of bluffing situation, to show how they might be handled in a computer program.

Most people have played some version or other of rummy. This is a card game in which the object is to make melds, groups of three or more cards of the same denomination (3 sixes; 4 queens; etc.) or three or more cards in succession of the same suit (ace, king, queen of hearts; 5 6 7 8 of spades; etc.). The players take it in turns to pick up a card from the deck (an unseen card) or the discard pile (a visible card) and then discard onto the visible pile. When one of them collects enough melds he wins the hand.

Here is an example of one player's hand in a game of PCW Rummy, in which each player has twelve cards and tries to make three or more melds, or two melds including nine or more cards.

SPADES: 5679
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Our player has already picked up a card and must now decide how to discard. How will he make his decision?

Clearly some sort of evaluation function is needed. The player can then consider each of the 13 possible discards in turn, evaluate his remaining cards and choose the discard that leaves him with the best hand. But is this enough? The discard itself may help the opponent, either by enabling the opponent to make a meld of his own, or by giving him information about the cards in the hand. It is this second point that is the key to a bluff.

Any good evaluation function will quickly determine that the queen of clubs is the least useful card to keep in the hand. Any other club discard will break up a meld of four, while a spade discard ruins the chance for a meld of five and the discard of an 8 or a king would split up a pair. So the obvious discard is the queen, but is it always the best card to play? It runs the risk that the opponent may have a pair of queens and need this queen for a meld, and it indicates to the opponent, quite truthfully, that a queen is of no use to this hand, so if the opponent is holding a lone queen he may well discard it in the near future, which will not help our player.

Now let us consider the discard of an 8. This has a lesser chance of allowing the opponent to make a meld of eights, and it makes it more likely that the opponent will himself discard the eight of spades, which will give our player a five card run in spades for a winning hand. Thus, the discard of an eight, while perhaps not being the very best play, will sometimes be worthwhile. It is always a good idea to vary one's style of play, and the value of "advertising" is often seen in an "obvious" but incorrect discard from the opponent. Thus, our evaluation function should not only include features to count the melds and part melds, and the safety of the discard, but also a feature to estimate the value of a particular advertisement.

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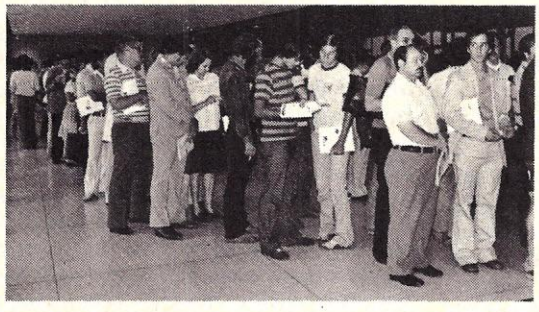

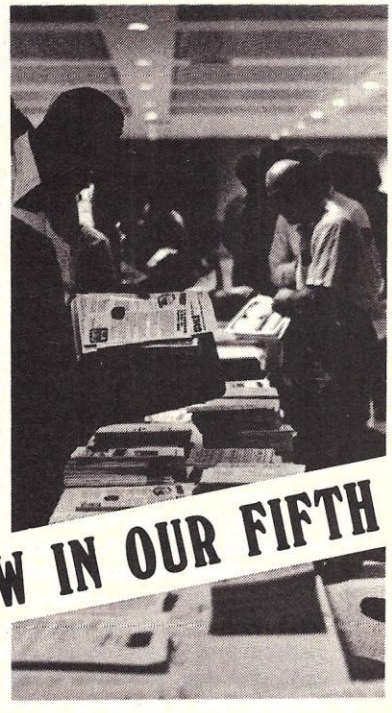

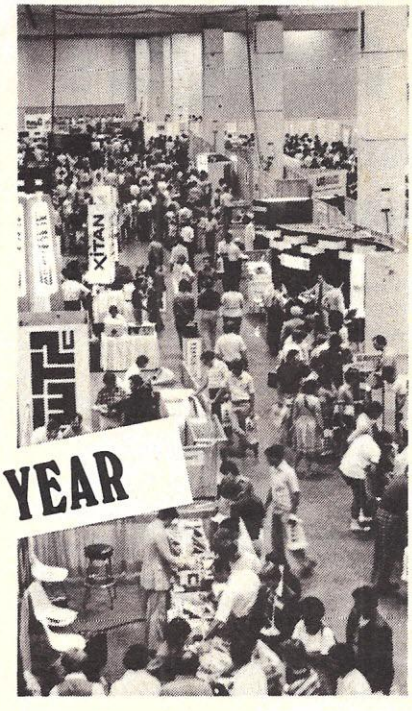

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CIRCLE 180 ON READER SERVICE CARD

Games, Cont'd...

The game which is perhaps best known for bluffing is poker. I have played poker for many years and I consider it to be one of the most skillful, if not the most skillful, card game. Without bluff, poker would have no interest of merit, so a good poker playing program must know at least some of the elements of bluffing play. Two of these elements are relatively easy to measure, if you happen to be an expert player or a computer program. We can understand them best by looking at an actual example of a poker hand (do not worry if you do not understand how to play the game — my example can be followed by anyone).

JOE: ? 6 6 J Q (the suits are unimportant)
FRED: ? 5 A J 9 (all diamonds)

This is the final stage of a hand of five card stud poker. In this game each player is dealt one card face down and one face up (left to right in the diagram), and then another card, and another, and another. After each of the four up cards there is a round of betting. We shall assume that the pot currently stands at 100 dollars and that a player may bet anything up to the current size of the pot. It is Fred's turn to bet and his hidden card (the ?) is the king of clubs. Let us first consider the situation from each side.

If Joe's hidden card is a 6, J or Q, then he will win the hand for certain, unless Fred has a hidden diamond, giving him five diamonds (known as a flush). If fred has a flush then he has the winning hand, irrespective of what Joe has as his hidden card. Joe does not know what has been keeping Fred in the game. If Fred's hidden card is an ace, then he would have had a pair of aces (quite good, but not as good as three sixes) since the second round of betting, so it would have been perfectly reasonable for him to stay in the hand. If it was a diamond then he would also have had some reason for playing the hand rather than dropping out at an early stage. What should Fred do? He has two options, he may "check," putting in no money and waiting to see what Joe will do, or he can bet up to $100.

If Fred checks then he is almost sure to lose the pot. Joe would be unlikely to bet against a possible flush, and so Joe would also check and the highest hand would take the money — the highest hand being Joe's pair of sixes (his third six would not even be needed). If Fred bets a lot of money, perhaps the maximum of $100, he may lose this money but on the other hand he places Joe in a difficult situation. What will Joe think? "Has he got another diamond?" Joe does a quick count of the cards he has seen, realizes that the odds are only 34 to 9 against Fred having a flush, and then he must make up his mind — "Is he bluffing or isn't he?"

How can a computer Fred decide when to bluff? It must first determine whether a situation lends itself to a bluff under any circumstances, and then, if it does so, whether these circumstances are realistically reflected in the particular instance. Here it is clear that the notion of a bluff does have some merit, because there is a finite possibility that Fred may hold the winning hand (unless you know that he has the king of clubs) irrespective of what Joe is holding. So the first thing to determine is the probability that Fred's hidden card will be enough to win him the pot. If this probability is over a certain threshold, Fred may consider a bluff. Whether or not he makes the bluff will depend largely on his estimate of Joe's discernability, which in this case means how often is Joe likely to call a bet of $100 in a situation of this type. The program would need to monitor Joe's play, and depending on how often he called a bet coming from a hand with four cards showing of the same suit, the program would decide what to do. It would base part of its decision on Joe's discernability, as estimated from his previous play, and part on the knowledge that against a player of very high or very low discernability it is inadvisable to bluff more than rarely (a really good player will not be fooled so easily, a bad one will often not notice what you are trying to pretend!). If the program decides that in this type of situation it should try a bluff against Joe in roughly 20% of hands, it will generate a random number on the range 0-1, and if it lies below 0.2 then it will try a bluff.

To summarize, a bluff should only be made when there is more than a slender chance of it being delivered (odds of 34 to 9 against are quite acceptable — I would suggest 5 to 1 as being a suitable threshold); but it should not be made against a player with very low or very high discernability, and not more often than once in n hands, where n is a function of discernability.

Task for the Month

Those of you who completed the earlier tasks involving noughts and crosses programs, will find this month's exercise somewhat trivial, but nonetheless instructive.

Write a noughts and crosses program to play a perfect game by means of exhaustive tree search. Test this version of the program against a program that moves at random, playing a number of games and noting the percentage score.

Modify the program to use Michie's method of backing up expected values, based on the assumption that the opponent will be moving at random, and play this version of the program against the random version. The results should indicate that slightly imperfect play can result in a better score than perfect play! □

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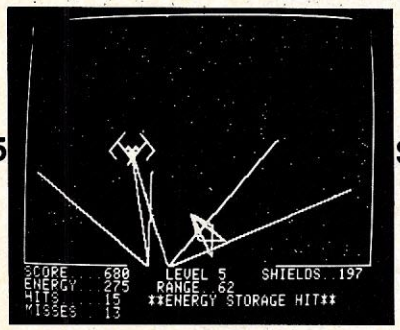

$19.95 DISK

Most shoot-em-up target games are 2-D shoot across the screen type, and quite frankly there is a glut of inferior ones. A need for a new approach exists, such as fast 3-D HIRES simulations with clever and complex challenges. How about shooting into the screen, into 3-D space, where the target is mathematically many feet behind the screen surface? How about computer intelligent targets that shoot back and use strategy and learn? How about all this and the best attributes of the more popular games? Let's include high score, 10 levels of play, snappy sound effects, colorful explosions and real time graphics. Why not go all the way and have a three dimensional gunsight? A real space battle simulation . . . Nah . . . no one would believe it or could even write it. Right?
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The machine plays chess?

Alex Bell

Alex Bell, a professional in the computer world and an amateur at chess, traces the development of the attempts to play the game mechanically from the late 18th century when Von Kempelen built the Turk, an automaton in which a man was hidden, until the present time and shows that machines hardly deserve the scorn heaped upon them by most chess players.

. . . The author tells his story with humour and relish and, by keeping technical jargon to the minimum, makes the book the most readable one I have so far seen on the subject. It should be of interest both to computer men who like chess and to players with a taste for mathematics.'

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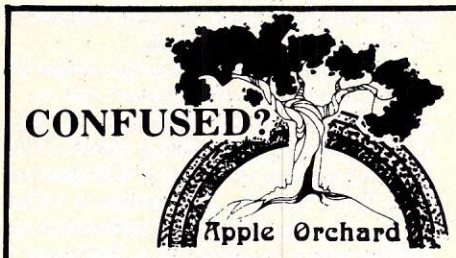

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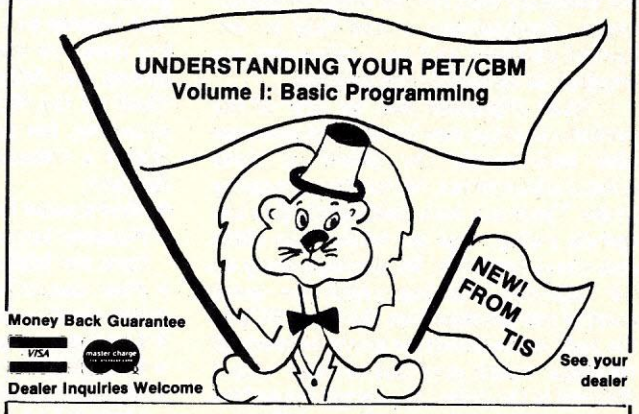

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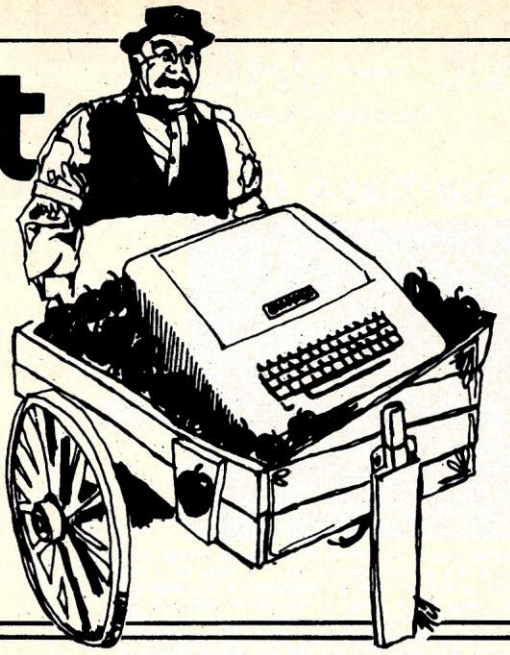
CIRCLE 193 ON READER SERVICE CARD

Apple-Cart



Chuck Carpenter

Correspondence is always welcome and a response will be made to those accompanied by a SASE. Send your letters to: Chuck Carpenter, 2228 Montclair Pl., Carrollton, TX 75006.

Disk Drives

Problems of I/O Errors occurring during read/write operations have become more frequent. Experiences of others and my own involvement indicates cost-reduced production may be the problem. With the cost-reduced drives, you have to be very careful to get the diskette centered over the clamp. If the problem seems unduly severe, you may need to have the speed calibrated and the drive mechanism re-aligned. The drive used by Apple is a stripped-down Shugart SA-400. The repair manual for the SA-400 will provide the necessary data for the required adjustments. Realignment is not easy to do. Special diskettes and an oscilloscope are required to make the adjustments.

Head alignment can be part of the problem so make sure it's done by someone who understands the nature of these critical adjustments. Motor speed is easier to do. There is a tach disk attached to the spindle pulley. One bar-track is for 60Hz and one is for 50Hz. By shining a lamp on the tach disc, you can adjust the speed control pot (mounted on the small PCB at the back of the drive) for zero movement of the bars. Make sure this is done with a diskette in the drive. The torque load of the diskette will make a significant difference in motor speed. There is a procedure for making this adjustment with a frequency counter too. And, be sure to check the head load arm and the head load pad for proper operation and wear.

The overall quality of current disk drives is the more likely problem. I have had to insert a diskette several times, on the newer units, to get a proper read. This condition will cause a problem with a write to the diskette too. If the diskette was not centered, the system would not be able to read/write the catalog track correctly. It would be possible to clobber things if you tried to write to an off-center track. One way to check centering is to always read from the disk first; do a CATALOG, for instance. Also, if you are having problems with reads/writes and getting lots of I/O errors, write to the Manager of Quality Control at Apple. The address is on various manuals you have. Describe the specifics of the problem. Especially describe the details of the conditions when it happens, frequency and so on. Don't try to vent your frustrations, though. You'll get a lot more help if you're rational.

Apple III

Apple's newest entry into integrated personal computer systems has arrived. The systems will be available to dealers by the time you read this, and to customers during the following couple of months. Most all the things Apple II owners pay extra for, are now included as standard. Here's a summary of the functions and features:

- 80 character lines, upper and lower case.
- Numeric keypad, RESET removed from the keyboard.
- Four cursor keys for easier editing.
- Improved audio and an external jack.
- Language system, e.g., Pascal.
- Calendar/clock
- Memory management for up to 128K RAM.
- Built-in serial interface for printer or modem.
- Interface for Silentype printer.
- 4 channel A/D input.
- Video interfaces.
- A new Sophisticated Operating System (SOS).
- Emulation mode which runs Apple II software.

And, all this will be available to you for a cost of about $4300.00 for the minimum system.

Hardware

Apple III will use a 6502A running at 2 MHz. Included with the 6502 instruction superset, are a relocatable base register page, a relocatable stack and a 128K byte address range (96K of memory is standard). Peripherals will function with full interrupt capability. A timer derived from the system clock can be programmed for durations up to 18 minutes. The power supply has been beefed-up and will allow 2 disk drives to be operated at the same time. A calendar/clock, integrated into the main circuit board, can be operated over 3 years on its battery. The new audio circuits use a 6 bit D-to-A converter to generate high quality sound to either the built-in speaker or through an external jack.

One drive is built into the Apple III with provisions to support up to 3 additional drives. The new drives will use a 16 sector system providing about 143K bytes of storage — about a 40% increase over DOS 3.2 (the new system is called DOS 3.3). An RS-232 communications interface port is built-in, too. Reference is made to its use with letter-quality printers. There is also a port for the Silentype thermal printer and provisions for an optional parallel printer card are provided too. Another connector on the back panel provides access to the 4 A/D inputs. The traditional joystick will be connected here. Since all connectors are now mounted on the rear panel, there is no longer any need to "lift the cover" to get inside.

The keyboard is detached and greatly expanded. There are 74 keys including a 13-key numeric pad. An alpha-lock key and a shift key are provided. RESET is behind the keyboard. Four cursor control keys are provided for easy cursor movement. And, the keyboard offers sculptured keys with textured surfaces. The keyboard has features obviously intended for such applications as word processing. A variety of video outputs are provided from black and white to high resolution in many colors. All video signals and voltages are available through a DB15 connector. Video display modes include 560 x 192 dot

For your Apple II....

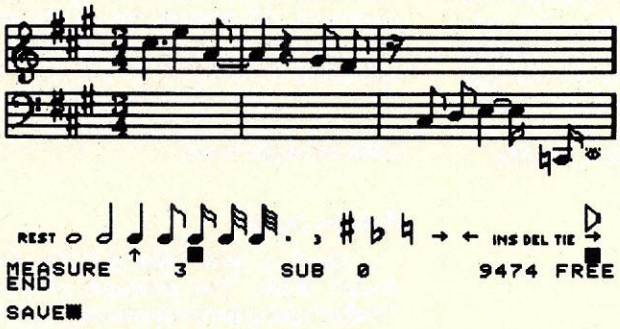
MUSIC & GRAPHICS

ALF Music Synthesizer

The ALF music synthesizer has three voices on each board which are easily programmed using the Entry program provided. The envelope shape of each voice (or even each note) may be controlled individually thus allowing the synthesis of practically any instrument such as a violin, trumpet, piano, harp or bells. Instrumentation and dynamics may be varied while a song is playing by changing the attack, sustain, release, decay, gap and volume of the notes.

Playback of music is accompanied by a spectacular color display showing a stylized "piano keyboard" for each part with the colors of the notes varying in proportion to their loudness and waveform.

Ease of Music Entry

Music is entered directly using the high-resolution graphics entry program. One paddle is used to select menu items such as note duration, accidentals, dotted notes, triplets, tied notes, etc. while the other paddle moves a note cursor up and down the staff over a 4-octave range. The transpose command extends the range to eight octaves. This form of music entry is considerably faster and more accurate than cryptic note code schemes (like QFS3) found with other synthesizers.

MUSIC ENTRY SCREEN

The board plugs into any Apple II or Apple II Plus. Two or three boards are required for stereo. Requires a 16K Apple system and external amplifier and speakers.

***ALF Apple Music II (AM-II) Synthesizer**

The AM-II is a new, low cost digital music synthesizer for the Apple II computer. It features 9 voices on a single music card.

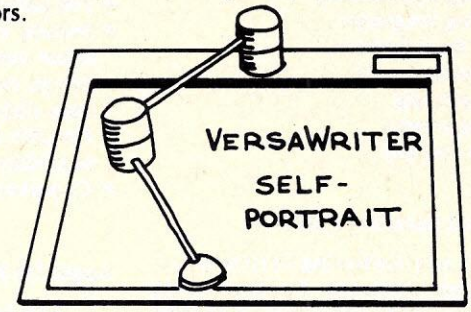
The software ENTRY and PLAY systems are the same as on the ALF Apple Music Synthesizer (AMS). The two principle differences between the new AM-II and the original Apple Music Synthesizer are in pitch range, volume range, and parts per board.

The new AM-II has a range of six octaves. The dynamic range is 28 db. (The original AMS has a range of 8 octaves a dynamic range of 78 db and 3 parts per board.)

VersaWriter

VersaWriter is a drawing tablet for the creation of full-color, high resolution graphic images on the Apple. Images may be drawn freehand or traced from existing images (cartoons, photos, drawings, etc.) using the simple pivoted two-arm pantograph with magnifying crosshairs.

After an image is drawn, it may be rotated, shrunk, or enlarged. It may be moved across the screen and alternated with other images thus providing high-resolution animation. The image may be colored with varied colors.



Animate other Programs

Graphical images made with VersaWriter and stored on tape or disk may be called from other programs or even imbedded in them. With VersaWriter, you don't have to worry about assembly code, counting pixels or other cumbersome hi-res graphics entry and retrieval techniques.

VersaWriter graphics can be used in all types of programs—games, statistics, engineering, artistic, and educational. Your only limit is your own imagination.

Two Disks of Software

Disk 1 contains the basic plotting, scaling, movement, rotation, color, transfer and recall software. This disk also includes routines which create "shape tables" from your figures to be used in other programs. Disk 2 contains applications software. One program adds five sizes of upper and lower case text to drawings, another adds standard electronic and digital symbols, while a third calculates distances and areas.

VersaWriter requires a 32 or 48K disk system, Applesoft in ROM or an Apple II Plus.

VersaWriter	$252.00
ALF Music Synthesizer	$268.00
AM-II Synthesizer	$198.00

Prices postpaid in USA. NJ residents add 5% sales tax.

To order VersaWriter or the ALF Synthesizer, send your name and address along with a check or chargecard number and expiration date. Visa, MasterCard and American Express are welcome. Units are in stock and orders will be shipped as soon as your check clears or your credit is verified.

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CIRCLE 207 ON READER SERVICE CARD

Apple, cont'd...

black and white, 280 x 192 dot hi-res color, 140 x 192 dot hi-res color, 80 column black and white text, 40 column color on color and all Apple II modes. Monitors will be the 12 inch Sanyo, 12 inch Hitachi and eventually Apple's custom 12 inch B&W monitor. An RF modulator can be used for connection to a television set.

Software

Apple's new Sophisticated Operating System is abbreviated SOS and pronounced SAUCE (I know!). The SOS is said to effectively manage these user and system functions:

- Running applications
- Accessing peripherals
- Accessing data
- Developing applications
- Developing languages
- Memory management
- Device management
- CPU scheduling
- File management
- Interrupt control

Features and Benefits of SOS

Apple's new Operating System maximizes system efficiency by controlling resource use and allocation. Software development is easier and program size and complexity is reduced through a powerful system interface for languages and applications. The flexible file system provides efficient system data storage and access, allowing applications to share data and faster access to information. Powerful new utilities provide complete application access to all of the advanced capabilities. To meet your system needs, SOS can be custom configured, even by the inexperienced operator, with the easy-to-use system configuration program. And, the system is designed to be easily expanded allowing you to further enhance the power and flexibility.

Visicalc III

An enhanced version of Visicalc, as sold for the Apple II, will be available exclusively from Apple for the Apple III. The package will take advantage of the 80 column screen, cursor controls and SOS file system. Incidentally, I saw a demonstration of Visicalc II recently. The capabilities of this system are super. If you're doing any financial planning or modeling, you can benefit from Visicalc. I'm getting a copy for my own use so I'll review it in a future column.

Additional Software

There will be a new Business Basic. It is intended to be the Apple standard and will feature formatting capabilities with PRINT USING, longer names for variables, fast disk access, nineteen-digit integer arithmetic and will support the IF-THEN-ELSE statements for enhanced program structure. (Sounds a lot like Microsoft Basic version 5.0.)

Pascal will be available too. The software will be upgraded for use with SOS. Pascal will feature improved performance and will be compatible with the Pascal file system on Apple II. Fortran, compatible with the Pascal file system, run-time package and program development tools will also be available. This will be an ANSI standard Fortran for compatibility with vast subroutine libraries for math, science, engineering and statistics. A Mail List Manager package will be available too. The program features:

- High speed entry of names, addresses and phone numbers.
- 970 names per diskette.
- Sorting a diskette in 75 seconds by either name or zip code.
- Merge capabilities allowing files to span diskettes.
- Flexible formatting and printing capability.
- Complete menu-driven user interface.

Apple III Packages

The Apple III will be sold as various application packages. These are intended to provide the nucleus of various user solution packages. With a variety of application software and hardware, the package becomes customized for individual customers. The three package groups identified at this time are: Information analyst, Word processor and Software development.

The information analyst includes:

- 96K Apple III
- SOS
- Apple Business Basic
- Visicalc III
- Mail List Manager
- 12 inch B&W monitor

The word processing system includes:

- 96K Apple III
- SOS
- Apple Business Basic
- Word Painter
- Training course to use Word Painter
- 12 inch B&W monitor
- Either a Silentype or letter quality printer

And, the software development system includes:

- 96K Apple III
- SOS
- Apple Business Basic
- Fortran
- Apple Pascal
- 12 inch B&W monitor
- Expansion drive

One final note. The system is packaged in a metal cabinet. There will be no more problems with radiation interference from the high-speed microprocessor circuits.

Super-Text Word Processor

This column was developed and written with my new word processor. The package is great. I have been looking for a word processor that would work well with Apple's limited screen capacity. The processor allows free-form entry of text. This means that you don't have to concern yourself with the 40 column limit. Output formatting takes care of putting the text wherever you want it to go. Upper and lower case are easily controlled, and if you have the Paymar Lower Case Adapter, you can see the text on the screen the same as it will be printed. Here's a summary of some of the features:

- Full screen cursor editing.
- Scanning forward or reverse.
- Line scrolling both directions.
- Paragraph scrolling both directions.
- Add text (also begins text)
- Change text for deleting or correcting.
- Math mode
- Print mode
- Auto link — one program to another.
- Options program.
- Diablo type printer controls.
- Formatting, tabbing, centering, justifying, etc., etc.

And much more. I've just starting using the processor so I'm not aware of all the features. I know I like what I have been able to do so far. The ease of use is really impressive. I'll provide the details later. The package is about $100.00 and it's called Super-Text, The Professional Word Processor. It's distributed by Muse Software and should be available at your local computer store.

Readers Input

Here's a neat little program from Randi Rost. The program is called "Puffer" and it moves the characters across the screen in billboard fashion. Randi says this Integer Basic program appears to "puff" a message across the screen. You must put as many characters or spaces in A$ as it is dimensioned for. In this example, 40. The program is an endless loop as written. Line 80 could be an escape by testing for a processed key. You can change the delay time by changing line 40. See the listing and sample run of the program.

Rosa Pascal Sez

For those of you who are using Pascal, included are a couple of short utility routines sent in by Ron DeGroat. These routines will let you do a couple of things in Pascal that are in Basic but not in Pascal. Following is the text of Ron's letter essentially as it was written:

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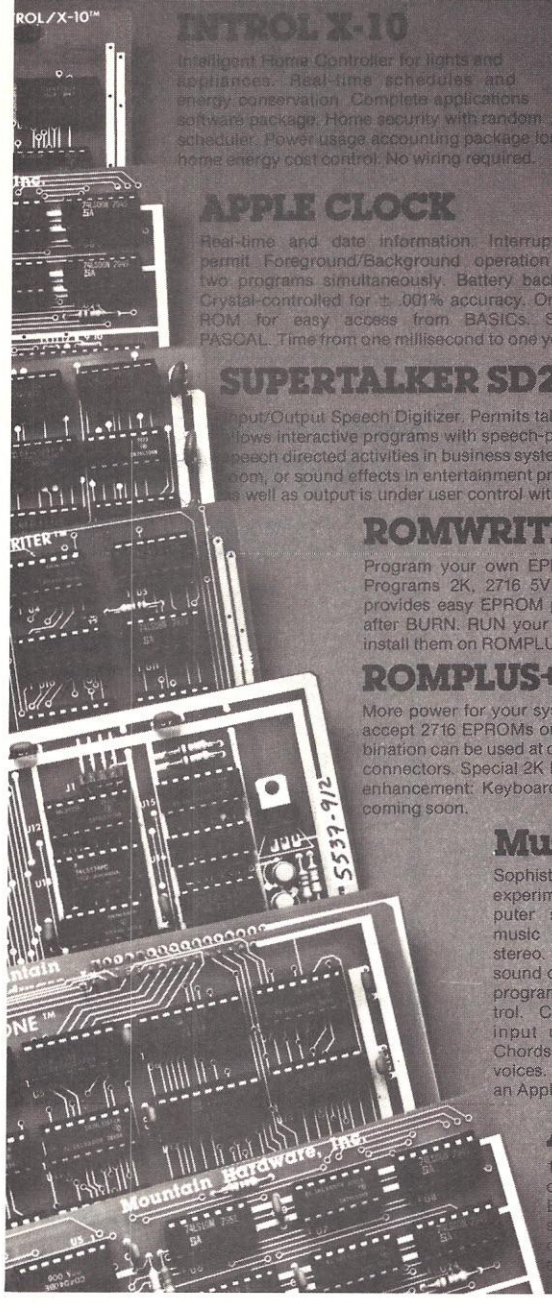

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Apple, cont'd...

The assembly language procedures shown in Listing #1 allow the user to display text in FLASHing, INVERSE and NORMAL modes with Apple Pascal in much the same way that Applesoft Basic does.

These procedures may be directly linked to the Pascal host (see example program in Listing #2) or stored in a UNIT in the SYSTEM.LIBRARY along with other useful utilities (such as PEEK and POKE routines, q.v., "The Multi-Lingual Apple" column in the Feb. and Mar./Apr. 1980 issues of Call A.P.P.L.E.). For more information about the control codes ($C083 and $C088) see Appendix D of the Apple Language System Installation and Operating Manual.

It should also be noted that since the Apple uses the top two bits of the ASCII characer code to select INVERSE and FLASHing modes, lower-case letters cannot be displayed in these modes.

LISTING #1: INVERSE, NORMAL & FLASH PROCEDURES

```
.PROC INVERSE
LDA ØC083   ;SELECT 2ND 4K BANK
LDA ØC083   ;AND WRITE-ENABLE
LDA #ØØ
STA ØD8ED  ;CLEAR BITS 6 & 7
LDA ØC088   ;SELECT 1ST BANK & WRITE-
RTS         ;PROTECT, THEN RETURN
;----------------------------
.PROC NORMAL
LDA ØC083
LDA ØC083
LDA #8Ø
STA ØD8ED  ;SET BIT 7 FOR NORMAL MODE
LDA ØC088
RTS
;----------------------------
.PROC FLASH
LDA ØC083
LDA ØC083
LDA #4Ø
STA ØD8ED  ;SET BIT 6 FOR FLASH MODE
LDA ØC088
RTS
```

LISTING #2: EXAMPLE PASCAL PROGRAM

```
PROGRAM TESTSTUFF;

PROCEDURE INVERSE;  EXTERNAL;
PROCEDURE NORMAL;   EXTERNAL;
PROCEDURE FLASH;    EXTERNAL;

BEGIN
  GOTOXY(Ø,1Ø);
  WRITE ('THIS SHOULD BE ');
  FLASH;
  WRITELN ('FLASHING');
  NORMAL;
  WRITELN;
  WRITE ('AND THIS SHOULD BE ');
  INVERSE;
  WRITE ('INVERSE');
  NORMAL;
END.
```

Note: For Pascal newcomers, constants in Apple Pascal assembly language must start with an integer, 0 to 9. If the first digit is greater than 9, i.e., A, B, C, D, E or F, the number must be prefaced with a 0, as shown in Listing #1.)

Listing and sample RUN of "Puff" program.

```
>LIST
   10 DIM A$(40): DIM B$(40)
   20 A$="ANY 40 CHARACTER STRING AT ALL IN HERE.."
   30 CALL -936: VTAB 10: PRINT A$
   40 FOR U=1 TO 200: NEXT U
   50 B$=A$(2,40)
   60 B$(40)=A$(1,1)
   70 A$=B$
   80 GOTO 30
   90 END

>RUN
ANY 40 CHARACTER STRING AT ALL IN HERE..
NY 40 CHARACTER STRING AT ALL IN HERE..A
Y 40 CHARACTER STRING AT ALL IN HERE..AN
 40 CHARACTER STRING AT ALL IN HERE..ANY
40 CHARACTER STRING AT ALL IN HERE..ANY
0 CHARACTER STRING AT ALL IN HERE..ANY 4
 CHARACTER STRING AT ALL IN HERE..ANY 40
CHARACTER STRING AT ALL IN HERE..ANY 40
STOPPED AT 40
>
```

How the Modification Works:

Listing #3 shows a section of code stored on disc in Block No. 4 of SYSTEM.APPLE file. When loaded into memory, this code resides in the second 4K bank of RAM, which must be selected and write-enabled with the control codes described above before any change can be made.

LISTING #3: CODE EXCERPTS FROM SYSTEM.APPLE

```
D8E8: E9 2Ø SBC  #2Ø  ;CONVERT TO U.C.
D8EA: 29 3F AND #3F   ;CHAR. MASK
D8EC: 9  8Ø ORA #8Ø   ;MODE SELECT:
                      ;  4Ø = FLASH
                      ;  ØØ = INVERSE
```

The character mask clears the top 2 bits of the character, and the next instruction sets the bit necessary for the mode selected. Thus, by changing the contents of memory location D8ED, as indicated, we can select either FLASHing, INVERSE or NORMAL modes. □

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George Blank

Apples, Oranges, TRS-80s and the Atari

The Atari, unlike the Pet, TRS-80, Apple, and Heathkit computers, does not have a Basic by Microsoft. This is a mixed blessing, or mixed curse, as you choose to look at it. The graphics and music handling abilities of Atari Basic are a true joy, while the string handling is difficult. Since most programs published in computer magazines like this one are not in Atari Basic, an understanding of the differences is helpful if you wish to convert the programs for your own use. Here are some of the differences between the Atari and the TRS-80, the most common Microsoft Basic computer.

String Handling

In Atari Basic DIM A$(50) means reserve 50 bytes of memory for a single variable named A$. You cannot store a single letter in a string variable unless you dimension it first. One advantage of this is that you can control the length of a string just by the DIM statement, something you cannot do in Microsoft Basic. For example, if you put:

```
10 DIM ANSWER$(1)
```

Then the computer will store only the first letter in the string even if it receives a whole sentence as a reply. This makes it easy to test an answer:

```
20 PRINT"ANSWER";:INPUT
ANSWER$:IF ANSWER$="N"
THEN50
```

In the TRS-80, memory for all string variables is reserved by a single CLEAR statement, with a default value of 50 bytes reserved automatically even without a CLEAR statement. In the TRS-80, DIM A$(50) means create an array of 51 string variables from A$(0) through A$(50).

In the TRS-80, the maximum length of a string ranges from 241 to 256 bytes, depending on circumstances. The Atari is limited only by memory available. This means that the Atari can make up for the lack of string arrays through a process of storing substrings in a very long string. One advantage of the Atari is that string sorting is potentially faster, as the TRS-80 has to pause and reorganize its string space.

Related to the string length is the restriction of a TRS-80 program line to 241 to 255 characters, while the Atari observes a different approach and limits you to 120 characters. Since some TRS-80 programmers like to put a whole subroutine in a single line, you would have to do a bit of reshuffling to translate their programs to an Atari. The lack of an ELSE command (see below) further restricts this approach in the Atari.

Sound

Neither the Atari nor the TRS-80 have a built-in speaker, as does the Apple II. The Atari sends sound effects through a television set speaker. If you are using a monitor that does not have a speaker, you do not have sound. Common practice with the TRS-80 is to connect an amplifier to the cassette output port.

The real difference in sound is that the Atari has a built-in sound capability allowing four completely separate voices at the same time with over 20,000 sound options, including a wide range of musical notes for each voice, while TRS-80 Basic can only alternate voltages at the cassette output port with OUT statements or machine language subroutines. Harmony is very difficult with the TRS-80, but easy in the Atari.

Graphics

It is not really fair to compare TRS-80 graphics to the Atari, as the TRS-80 is strictly medium resolution black and white while the Atari has high resolution color. To fairly represent Microsoft Basic, the Apple should be included in the discussion. One advantage the TRS-80 does enjoy is easy mixing of text and graphics on the screen, which is more difficult with the Apple and the Atari. Also, the TRS-80 has a built-in video memory that does not require user memory, while the Apple and Atari require user memory and, in high resolution, lots of it.

The Atari has 16 different graphics modes, and some of the graphics in the Atari ROM cartridges, including the motion through space in Star Raiders and the ability of the basketball players to overlay each other in Basketball, promise more graphics power than any other popular home computer. Right now, a side-by-side comparison of Apple and Atari graphics seems a standoff because the Atari graphics are not yet documented and explained, but if this kind of graphics ability becomes accessible to the end user, the Atari will be the obvious choice.

A common problem in high resolution graphics is that it requires a lot of memory to store a detailed image. The normal sacrifice limits the number of colors available in hi-res so you need less memory to store color information. The Atari limits you to two colors in high resolution, while the Apple gives you four. However, the Atari allows you to choose your color and tint and even allows you to change the color of an image on the screen instantly by changing a color register that tells the computer what color to make the image. The Apple cannot match this ability.

My personal favorite among the graphics commands of the Atari is the DRAWTO statement, which draws a line

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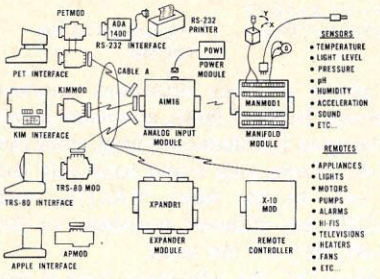

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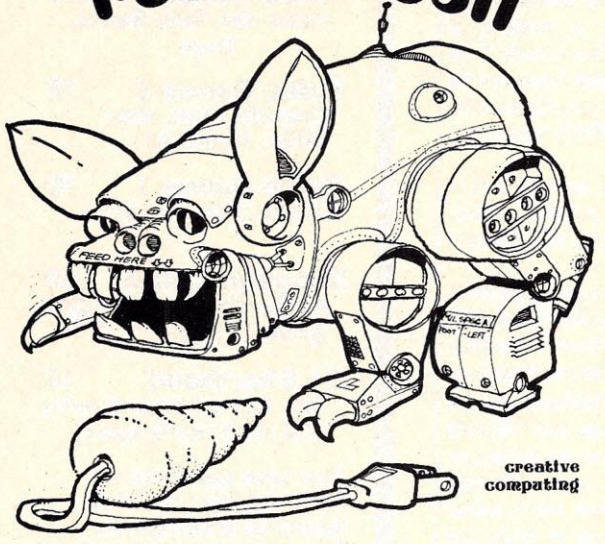

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Atari, cont'd...

from the last plotted point on the screen to any other point. More or less the same ability is present in the HLIN and VLIN commands in the Apple, though not as easily, nor as fast. In the TRS-80, it is necessary to write a subroutine to plot each point individually.

Text Handling

Text handling in the Atari is not as convenient as the Microsoft Basics. The TRS-80 is particularly good at text formatting and printing. Microsoft Basic allows you to include text in an INPUT statement, like this:

```
10 INPUT"What is your answer";A$
```

Atari Basic requires a separate print statement:

```
10 PRINT"What is your answer";:
   INPUT A$
```

The TRS-80 allows you to print directly at any point on the screen with PRINT @:

```
10 PRINT @ 572,"X MARKS THE
   SPOT"
```

The Atari requires you to position the cursor first, then print your message:

```
10 POSITION 8, 12:PRINT
"X MARKS THE SPOT"
```

Still another difference in text handling is the power of Microsoft Basic's PRINT USING command, allowing you to specify automatic print formatting with a fixed number of decimal points, floating dollar signs, fixed spacing, and other conveniences. These things have to be done by manipulating a string in Atari Basic.

I have begun to experiment with a whole new approach to text in the Atari that may be even more convenient. The Atari allows you to treat the keyboard, the video memory, and any other I/O device as a file. I suspect that once I get used to this, I will not really mind giving up PRINT USING.

There is a more definite limitation to the Atari in one of the key text handling areas, and that is in word processing. Forty columns per line is simply not as convenient as the longer lines on some other computers. The problems here are color and expense. It is much easier and cheaper to give text processing ability and sharp resolution to a computer which does not use a video modulator and does not use color. The Heathkit H-89 with 24 lines of 80 characters has much sharper letters than the Atari, yet the Atari limits you to a mere 38 to 40 characters. A lot of this problem could be overcome by designing the Atari to be used only with a high quality color monitor, but that would price it right out of the consumer market. My own solution is to use a different computer for word processing, including the writing of these columns.

Jumps and Subroutines

One of the areas in which Atari Basic enjoys an advantage over Microsoft Basic is in the ability to transfer control to another line through a variable. This has a lot of potential. Look at these comparisons:

Atari	TRS-80
10 GOSUB TIMEOUT	10 GOSUB 500
20 GOSUB BASKET	20 GOSUB 600
10 RATING= 880 + 4 * BASKET	10 RA=INT(BA/5)
20 GOTO RATING	20 ON RA GOTO 900, 920, 940

The above example illustrates another difference. In Atari Basic, a variable name may be up to 120 characters long, while the TRS-80 allows only 6 and tests only the first two. In the Atari, VALUE1 and VALUE2 are different variables. In the TRS-80, they are the same.

However, the advantage here is not altogether to the Atari. Radio Shack's Level II Basic allows an ELSE statement, while the Atari does not.

Atari	TRS-80
10 IF A=5 THEN 50 20 GOTO 100	10 IF A=5 THEN 50 ELSE 100

Input/Output

A major strength of Atari Basic over Microsoft Basic is in its generalized output routines. This is due to a feature known to mainframe programmers as device orientation. In Atari Basic, PRINT is a generalized output command. While the default device is the video screen, the computer doesn't really care whether it is printing to a line printer, a modem, a cassette tape, a disk file, or the screen. You can even use a variable to shift from one to another in your program, virtually at will. The general format of an OPEN statement hints at the power here:

10 OPEN (Reference number), (input/output/both), extra printer code), device type), device number): (file name). (extension)

Disk file opening might look like this:

```
10 OPEN #2,8,0,"D3:LESSON.BAS"
```

Chapter 5 in the Atari reference manual gives a more detailed explanation.

What do all these differences mean? My answer is: "Not a whole lot!" Nearly anything that can be done in one Basic can be done in any other Basic, even a limited one like IBM Basic. It just takes extra effort, a little understanding of what the other program is trying to accomplish, and a little creative ingenuity.

Basketball

One of the first Atari games is still one of the best. In Atari Basketball, you use the joystock controller to move around the court, dribble, shoot, pass, block shots, and steal the ball. The exceptional graphics and animation of this game make it a favorite demonstrator at computer stores, so many of you have already seen it.

How well does it play? The answer is that it is relatively easy to beat, but not easy to trounce. The computer is set up to play better when it is behind than it does when it is ahead, so it offers a good challenge until you get really good. However, once you can consistently trounce the computer, you've only begun the real fun!

The best feature of Basketball is that it allows one to four people to play at the same time. There are five options:

1. One player against the computer
2. Two players against the computer
3. Two players against one player and the computer
4. Two players against two players (no computer player)
5. One player against one player (no computer player).

After all, if you let your best friend play Star Raiders, it may be weeks before you get a chance at the computer again! With Basketball, you can both play at the same time. Teams of two are even more fun. This is one of the best computer games available for more than one player.

Basketball requires one joystick controller for each person playing and is available for $39.95. □

051

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Introduction to Small Systems for Business, Stan Veit, Associated Computer Ind., noon, Oct. 30 & 31.
Mailing Lists: Several Directions, Dr. Norman Agin, Mathtech, Inc., noon, Oct. 30 & 2 pm, Oct. 31.
Selecting A Small Computer for Business, David Benevy, Computer Mart of NJ, 1 pm, Oct. 30 & 31.
Evaluating and Improving Your Computer's Performance, Philip Grossman, Raytheon Co., 1 pm, Oct. 30.
Law Office Systems Aspects of Word Processing, Bernard Sternin, 2 pm, Oct. 30.
Future Smart Machines: 2000 A.D. and Beyond, Dr. Earl Joseph, Sperry Univac, 2pm, Oct. 30.
Computer Contracts - Facing the Issues, Alan C. Verbit, Verbit & Co., 3 pm, Oct. 30.
Acc'ts Receivable/Acc'ts Payable/Gen'l Ledger, 3pm, Oct. 30.
Advantages of Distributed Processing & Multi-Processing, John Steefel, QI Corp., 4 pm, Oct. 31.
Investment Analysis of Stocks & Commodities on a Microcomputer, Fred Cohen, Shearson Loeb Rhodes, Inc., 4 pm, Oct. 30, 3 pm, Oct. 31.
BASIC Programming, Michael Mulcahey, Worcester State College, noon, Oct.31.
Videoprints: Full-Color, Low-Cost, Hard-Copy Computer Graphics, Warren Sullivan, Image Resource Corp.,1pm, Oct. 31.
Business Applications Software Development Via Data Base Management, Dr. Andrew Whinston, Micro Data Base Systems, 2 pm, Oct. 31.
Application of PASCAL to Small Systems for Business, Panel, Stan Veit, Associated Computer Ind., Moderator, 3 pm, Oct. 31.
Educational Software: the Good, the Bad, the Ugly, Jo Ann Comito, S.U.N.Y. at Stony Brook, noon, Nov. 1.
Introduction to Personal Computing, noon, Nov. 1.
Computer-Assisted Mathematics Courses, Dr. Frank Scalzo, Queensborough Community College, 1 pm, Nov. 1.
Artificial Intelligence Update, Prof. Peter Kugel, Boston College, 1 pm, Nov. 1.
Compiling and Retrieving Personal Medical Data with a Microcomputer, Derek Enlander, MD, St. Luke's Hospital, 2 pm, Nov. 1.
The Present State of CP/M Compatible Software, Tony Gold, Lifeboat Associates, 2 pm, Nov. 1.
High Volume Data Handling: Intro. to File Processing, Prof. Peter Kugel, Boston College, 3 pm, Nov. 1.
Connecting the Computer to the Outside World, Prof. James Gips, Boston College, 3 pm, Nov. 1.
Educational Applications in the Home, David Ahl, Creative Computing Magazine, 4 pm, Nov. 1.
Household Applications - Some of Them New, Dr. Dennis J. McGuire, 4 pm, Nov. 1.

(Additional lectures to be announced)

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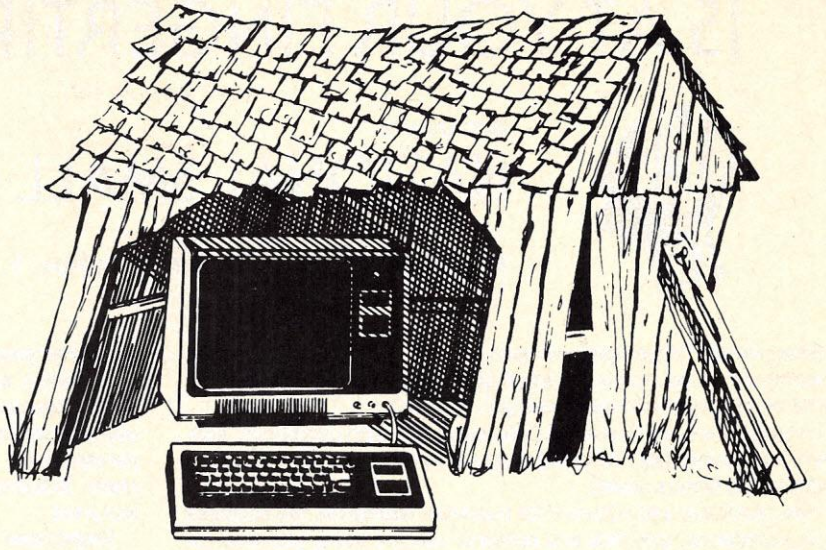
TRS-80 Strings

Stephen B. Gray

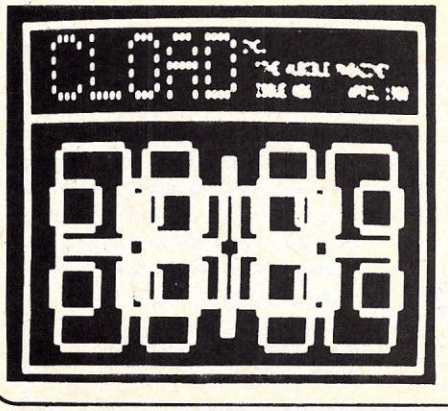


For TRS-80 column number 21, we unravel another CLOAD cover-art program to see what makes it work, take a brief look at Radio Shack's new "TRS-80 Videotex" information retrieval system, look at three machine-language games from The Software Association, take note of a three-day course on TRS-80 interfacing, check out three of Leo Christopherson's games that stress graphics, and end with a short program that displays your keyboard input backwards.

CLOAD Cover Graphics #2

The cover of CLOAD magazine for April 1980 is based on rectangles. The program draws random four-way-symmetrical rectangles, starting near the center of the screen, then (in the top-left quadrant) running up, left, down and right.

After 15 sets of four rectangles are drawn, starting at random locations and with random widths and length, the program shifts to RESET mode, and creates 15 sets of "black" rectangles that blank out parts of the 15 white ones, to create fascinating designs.



The 74 program lines can be reduced to a hard core of 40 lines containing 43 statements:

```
 10 CLS
110 S=0:N=0:F=15
200 A=RND(57)+2
210 B=RND(11)+17
220 L=INT(RND(59-A))+4
230 W=INT(RND(28-B))+2
290 FORY=B+WTOBSTEP-1
300 X=A+L
310 GOSUB670
320 X=X+1
330 GOSUB670
340 NEXTY
370 FORX=A+L-1TOA+1STEP-1
380 GOSUB670
390 NEXTX
430 FORY=BTOB+W
440 X=A
450 GOSUB670
460 X=X-1
470 GOSUB670
480 NEXTY
510 FORX=A+1TOA+L-1
520 GOSUB670
530 NEXTX
570 N=N+1
580 IFN=FTHENS=1
590 IFN=F*2THENN=0:S=0
600 GOTO200
670 REM
700 IFS=0THEN770
710 RESET(X,Y)
720 RESET(127-X,Y)
730 RESET(X,61-Y)
740 RESET(127-X,61-Y)
750 RETURN
770 SET(X,Y)
780 SET(127-X,Y)
790 SET(X,61-Y)
800 SET(127-X,61-Y)
810 RETURN
```

In the uncut version of this program, there is a third statement at the end of line 590, GOSUB870, which jumps to a subroutine that erases the rectangles display by PRINTing a long line of blanks. This is a selective "erase" that clears only the bottom two-thirds of the screen.

If you leave out GOSUB870, the bottom two-thirds of the screen will not be cleared at the end of the 30-rectangle cycle, and the new rectangle display will overlay the old one, so that eventually it begins to look like the architectural floorplan of some huge, ancient castle.

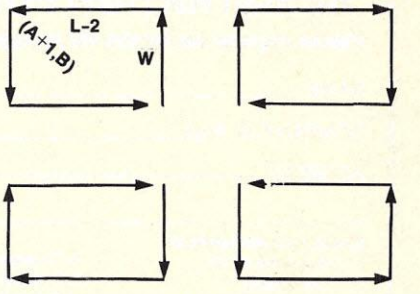
If you do add :GOSUB870 to the end of line 590, the program runs one full cycle, and then you get error message

?UL ERROR IN 590

because "an attempt was made to branch to a non-existent line," as the Level-II Basic Reference Manual puts it.

Lines 200-230 provide random values (A and B) as the basis for the starting points and for the horizontal length and vertical width of the rectangles, with L ranging from 4 to 60, and W from 2 to 12.

Lines 290-340 draw the up (right) side (in the top-left quadrant) from B+W to B;



lines 370-390 draw the top side, A+L–1 to A+1; lines 430-480 draw the left side, from B to B+W; and lines 510-530 draw the bottom side, from A+1 to A+L–1.

The top and bottom sides of each rectangle are one graphics block high, whereas the left and right sides are two blocks wide, created by lines 320 (right side) and 460 (left side).

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CIRCLE 139 ON READER SERVICE CARD

For the TRS-80* Microcomputer MOD I

Time To Go Back To Work ! ! !
The "BOSS" Is Here

written by V.B. Hester

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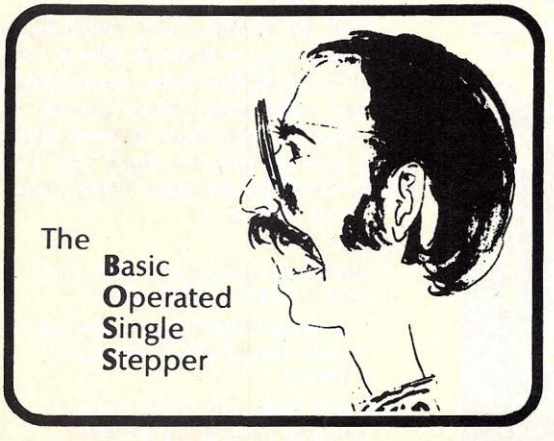

A Machine Language Debugger for your Basic programs. No other program even comes close to the power of this program.

The features are:

1. Modified Trace Function to display only 4 locations at a time in the upper right hand corner of the screen, this permits using the trace function and not destroying the screen display while the program is running. (you can also trace to the printer)

2. Single step option permits the execution of a program one line at a time and permits the checking variables to find where the problem is in your program, or to find where the program goes for those of you that are trying to modify a program to meet your needs but don't understand the program lodgic enough yet.

3. Setting break points. Permits running a program at normal speed until you reach the part in the program that you want to single step through. You can set up to 5 break points.

4. Display variables: keeps track of a select group of variables that you select (and can change at any time) and permits the examining of these. A command swaps the screen memory out to high memory and replaces it with your variable chart. Another command brings your screen memory back from high memory and it is complete (like graphics programs that are hard to continue without the graphics, can now be continued like you never stopped).

5. Stacking programs: permits you to stack one or more basic programs in high memory while you work on or run another program. You can call these programs down at any time to merge to the program that you are working. (limited only by the memory size of your machine).

This program sold on cassette for $29.95 and works in Level II or DOS (works under TRSDOS 2.1, 2.2, 2.3, NEWDOS 2.1 we do not have NEWDOS-80 yet to test) and comes with 13 page manual. Automatically relocates itself to not interfere with other machine language programs that you have in high memory.

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CIRCLE 153 ON READER SERVICE CARD

TRS-80, cont'd...

Lines 570-600 keep track of how many times the rectangles have been drawn. In line 580, if N equals the value of 15 at which F was initialized in line 110, the mode shifts to RESET, and the "black" rectangles will be drawn.

In line 590, if N is 30, then it's time to erase the rectangle display, and start over with a jump back to line 200.

Lines 670-750 include the RESET lines that create the four black rectangles. The four side-drawing routines jump to these lines constantly.

In line 700, if S is 0, that means the display is blank, and the program jumps to lines 770-810, which draw the four white rectangles. But if S has been set to 1 in line 580, the 15 white rectangles have already been drawn and it's time to shift to RESET by skipping over the jump in line 700 and going to line 710.

Note how the four SET and four RESET lines create symmetrical rectangles by subtracting the X value from 127 and the Y value from 61, in four different combinations, for the four quadrants. You might want to check this out by running a short program made up of lines 770-800 and various values of X and Y.

This program, called Boxes, was written by Mark Schwenk of Pekin, IL. If you have any trouble figuring out exactly how it works, use TRON and follow the program flow.

Videotex

Jumping the gun on the competition, Radio Shack has started marketing "TRS-80 Videotex," which will turn any home telephone and TV set into an information retrieval system for accessing databanks.

For just under $400, you get a decoder that connects your TV set and telephone, plus some memory and a keyboard. If you've got a TRS-80, all you need is the decoder, which is about $200.

The Videotex network will first offer access to newspapers, wire services and stock-and-bond prices, from CompuServe, at $5 an hour. Plans are to later offer information to subscribers on weather, sports, airline schedules, etc.

Incidentally, the French PTT people are working on a similar system, which they hope to market for much less, designed to eliminate telephone books.

Creative Computing Software

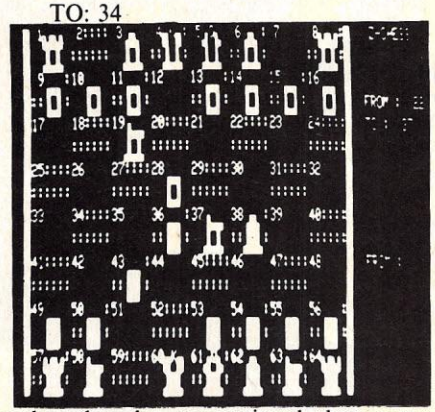
Z-Chess

Z-Chess, at $19.95, can be played at seven levels of difficulty, from 1 with three levels of look-ahead and an average of 10 seconds per computer move, to 7 with six levels of look-ahead and about 30 minutes per computer move.

Z-Chess plays all moves including castling and en passant, in an aggressive game that wastes no time getting the pieces out there for a fight.

The display takes only a short time to get used to. The king and queen do look a little odd at first, but they're identified with a K or Q. Each square is numbered, from 1 to 64, and moves are indicated quite simply by

FROM: 06
TO: 34



rather than by conventional chess-move notation, which takes longer unless you're familiar with it.

A set-up mode "allows the player to preset the board to any position prior to starting the game, or to change the board at any time during the game. This feature also allows the solving of mate-in-two problems."

Z-Chess is available for the 16K Level II TRS-80 on disk (CS-3513) and cassette (CS-3017) for $19.95 from Creative Computing Software, P.O. Box 789-M, Morristown, NJ 07960. Or call 800-631-8112.

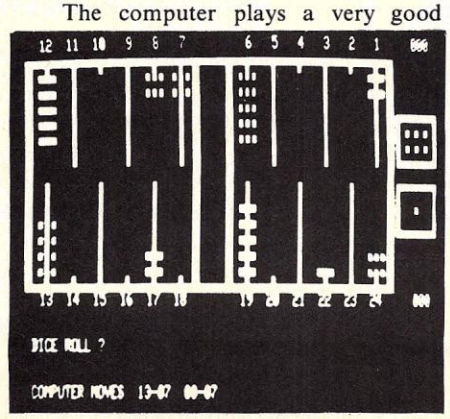
The Software Association

Two machine-language 16K Level-II games are available from The Software Association (Box 58365, Houston, TX 77058): Back-40 and Dr. Chips.

Back-40

The display for this $14.95 backgammon game is very clear, the game is easy to play, and the dice are rolled graphically. A pair of dice at screen right show several faces before settling down.

The computer plays a very good



game, and if you need any instruction in the fine points, just watch its moves. However, no basic instructions are provided for how to play backgammon, so you'll have to get them elsewhere if you don't know how to get off the bar, etc.

Every feature of standard backgammon is included, such as the doubling cube, and the computer even keeps score.

Dr. Chips

This $14.95 program is not really a game, as the booklet notes, but is rather a 'conversationalist,' based on the famous Doctor and Eliza programs, in which the computer plays the part of a pseudo-psychiatrist.

The booklet notes that the "Dr. Chips responses are intended only for fun, and they should not be taken seriously," and says it's a "natural introduction to computers for the family and friends, and a super 'conversationalist' and 'ice breaker' at parties, where everyone will want to have a turn at talking to Dr. Chips."

After loading, the first display is

HELLO, I'M DOCTOR CHIPS —
THE BRILLIANT PSYCHOANALYST.
PLEASE STATE YOUR PROBLEM
AND I WILL TRY TO HELP YOU.

So if you type in

I FEEL DEPRESSED

the computer comes back with

TELL ME MORE ABOUT SUCH FEELINGS

to which you might respond

MY DOG RAN AWAY

and so you get back

YOUR DOG RAN AWAY?

The program is a combination of picking up on your words and turning them back at you, plus a set of responses based on certain key words you might use. So if you reply

YES

to the previous question, you get back another question

WHY

and if you answer

I DON'T KNOW

you get yet another question

WHY DON'T YOU KNOW?

And so it goes, very much like a psychiatrist (but remember, this is "only for fun"), asking questions, some of which may not make much sense, because the program obviously can't respond intelligently to everything you might 'say.' So if you continue the previous 'dialog' with

I WISH I KNEW

you get

DOES THAT RELATE TO THE FACT
THAT YOUR DOG RAN AWAY?

Try using vulgarity, and you get

PLEASE THERE IS A COMPUTER
PRESENT.

and if you insist, Dr. Chips asks

WHY DO YOU TRY TO ATTRACT
ATTENTION BY USING FOUL
LANGUAGE?

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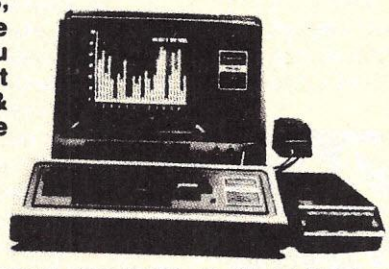

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just to name a few. You can even read names from a mailing list to generate form letters or produce camera ready copy (like this). At $350 (plus $175 for P&T CP/M 2, if you don't already have CP/M), Magic Wand gives you more word processing power per dollar than any other system available.

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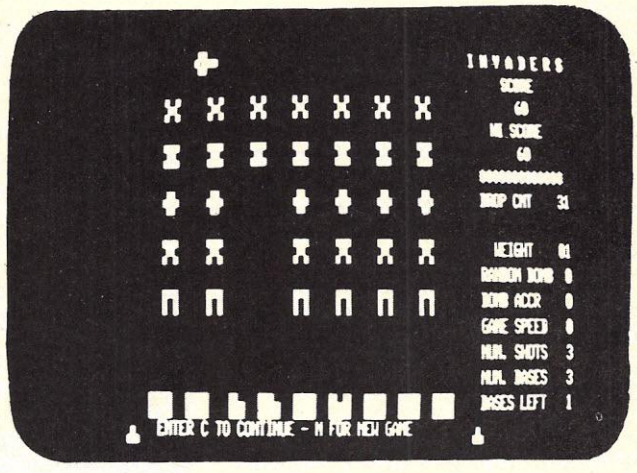
CIRCLE 179 ON READER SERVICE CARD

"MACHINE LANGUAGE & SOUND EFFECTS"

INVADERS FROM SPACE

by Carl Miller



A NEW ATTACK IS LAUNCHED

Just when it seemed to be all over, Acorn introduces a new and faster machine language version of this classic space game. In the game, the aliens are dropping bombs, moving from side to side, and trying to overrun your bases. You try to hold them off by shooting at them and scoring with each hit.

In *INVADERS FROM SPACE* you choose the game speed, the enemy bomb frequency and accuracy, the number of shots on the screen, and the number of your bases. These choices produce a weight scoring factor, and make it fun for all ages.

Move your base and fire at the invaders--both at the same time--which you can not do in most similar games. Full sound effects add excitement to the incredible speed and action of *INVADERS FROM SPACE.*

Acorn produces many game programs for the TRS-80*. These include *PIGSKIN,* the one-or-two player football strategy game; *PINBALL* a graphic arcade game; and *GAMMON CHALLENGER,* the popular backgammon program. Each is available at only $14.95 on tape and $20.95 on disk for a 16K Level II TRS-80*. Ask for these and other quality programs at your local computer store.

TRS-80 is a trademark of Tandy Corp.

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Acorn
Software Products, Inc.

634 North Carolina Avenue, S.E., Washington, D.C. 20003

CIRCLE 101 ON READER SERVICE CARD

TRS-80, cont'd...

and if you still insist, you get

OK — THAT'S ENOUGH OF THAT.

The program recognizes at least four obscene words.

When stuck, the program takes a new tack such as

I DON'T BELIEVE THAT I
FULLY UNDERSTAND YOU

or perhaps

HOW DOES THAT QUESTION
RELATE TO YOUR PROBLEM?

This is a fascinating program, especially to people who've been in analysis, and to analysts. I've heard that psychotic people usually don't believe it's a computer program, but think the display is being generated by a psychiatrist in another room . . .

The Software Association is off to a very good start with these three programs, and we hope to see more from them.

TRS-80 Interfacing

A five-day course on "TRS-80 Interfacing, Programming and Scientific Instrument Automation" was given by the Dept. of Chemistry and the Extension Div. of Virginia Polytechnic Institute and State Univ., at Blacksburg, VA, on June 23-27.

A three-day workshop on "TRS-80 Interfacing, Applications and Programming" was given by the same organization on July 14-16, at the school's Northern Virginia facility next to Dulles International Airport in Washington, D.C.

The three-day workshop will be repeated later this year, on Dec. 8-10, in Blacksburg. The instructors will be Drs. Jonathan and Christopher Titus, president and vice president, respectively, of the Blacksburg Group, and who publish the famous Bugbooks. Course materials will include the two books on TRS-80 interfacing by Jonathan Titus.

The $350 workshop "will concentrate on the design and development of TRS-80 interfaces, for use in data acquisition, control, monitoring and other applications," and is recommended for TRS-80 users "who have some experience with Basic programming and digital electronics." You can bring your own TRS-80.

For further information, contact David G. Larsen, Virginia Tech, Blacksburg, VA 24061.

Three By Leo C

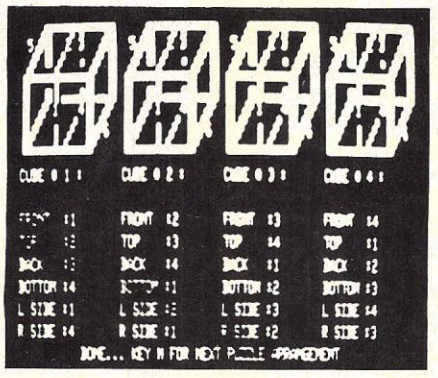
One of the brightest TRS-80 programmers in the country is Leo Christopherson, whose Android Nim *(Creative*, June 1979, p 125) from 80-US is a model of how animated graphics can enliven a game, and should be examined closely by anyone interested in creating such graphics.

However, there's just so much graphics can do for a game. Two of Leo's recent games, Cubes and Snake Eggs, are games in point. Both are beautifully programmed, with very clever graphics, yet even the most devoted of games players would probably be interested in no more than a few games. After all, marzipan is used to create some beautiful candies, but how much marzipan can you eat?

Cubes

Cubes is a computer version of the Instant Insanity game, by the Parker Brothers division of General Mills Fun Group.

Perhaps you've seen those four colored plastic cubes, which you're supposed to arrange so that "when placed side by side, each consecutive top (or bottom, or front, or back) is of a different color."



The Cubes program asks you to select four different colors or numerals (it works easier with numbers), and then assign one of the four to each of the 24 cube-sides involved. Then the program "begins rearrangement of the blocks, stopping to display a solution . . . if there is one."

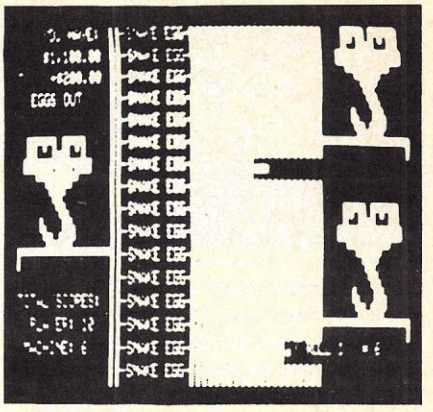
After you've played this $9.95 game a short while, you may well find yourself wanting to get your hands on the four plastic cubes.

All I can get out of this game is that it teaches you that conformity to a pattern will win, and that totally random activity (in assigning colors to cube-sides) probably won't. Hmmm.

Snake Eggs

There's no animated graphics in Cubes, but some beautiful examples of it are in Snake Eggs, $14.95 at your neighborhood store or from 80-US (3838 South Warner St., Tacoma, WA 98409).

Snake Eggs is a version of Twenty-One and might be called Forty-One, except that, instead of dice, the game uses snakes. The snakes lay eggs, which are rolled across a striped field. The stripes carry number values, from one on up, and where the egg stops, that's your point. You and the computer continue to roll in competition, and whoever gets closest to 41, without exceeding it, wins. A roll of 'snake eggs' automatically wins, and a roll of 'scrambled eggs' loses.



The graphics are a work of genius. The snakes, which move even when you're making up your mind how much to bet next, constantly move their heads and tails. And if you plug an amplifier into the AUX of your machine, you hear the snakes 'talking,' and "snake-language comments will be translated for you."

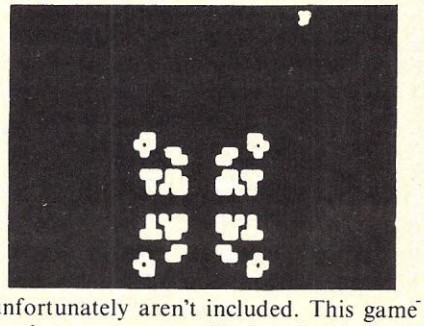
If you win, the program plays a snappy Sousa motif, and if you lose, you get the theme from Chopin's "March for the Dead."

But somehow Snake Eggs just isn't all that interesting, despite the fantastic graphics and marvelous sound effects. The Controller Snake has to coax the two egg-laying snakes just a little too much to lay eggs, and after a few games of this, you may want to play some cards just for a real 'hands-on' game.

Lifetwo

Here's a third program by Leo, which you may find yourself playing again and again. Lifetwo consists of two versions of the famous Life game, and is $14.95.

The first version, Game of Life, "allows you to set up a pattern and watch the resulting life patterns unfold according to Conway's standard Life rules," which



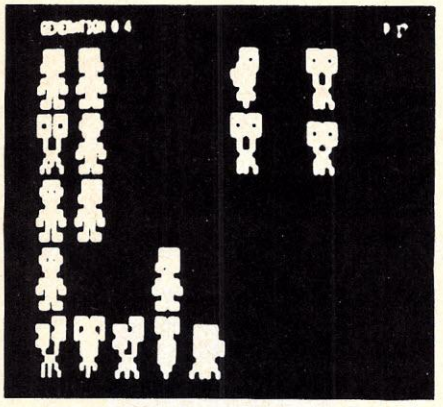
unfortunately aren't included. This game has been programmed before, but Leo has managed to make the generations zip along at about 100 per minute!

Even if you know the rules of Life, you may find yourself trying and trying to come up with patterns that will stay dynamic forever.

The second version, Battle of Life, uses sound, mostly of the zap, sploing, and rat-tat-tat type, plus some 'talking' by the four life forms (biped, triped, uniped and quadruped) that allow up to four players to

participate. The four life forms are beautifully done, and move every now and then.

Each player chooses a life form and places up to six of them at various positions on a 10-by-5 grid. The game then proceeds according to Life rules, stopping after every five generations to allow each player to add two more lifeforms to the grid.



The instructions say you can hear the sound by plugging the AUX cord into an audio amplifier but, as with Snake Eggs, you can listen in by putting an AM radio near the keyboard.

Short Program #12

Thomas L. Ward, of Pasadena, CA, sent this:

"Here's another version of Short Program #2 to display name backwards:

```
100 X=15379
110 CLS
120 PRINT "WHAT IS YOUR NAME?"
130 POKE X,95
140 A$=INKEY$
150 IF A$="" THEN 140
160 B$=A$+B$
170 PRINT @ 20,B$
180 GOTO 140
```

Short Program #2 was in *Creative*, June 1979, p 126."

This program spins the name out of a location two spaces after the question mark, and moves it to the right. If you then press ENTER, the name appears again, flush left, and if you press ENTER repeatedly, moves down the screen.

One problem: the name (or message) is limited to 25 characters. After that, you get

```
?OS ERROR IN 160
```

and the rest of the name appears in normal fashion. In Short Program #2, the name (or message) begins at the right of the screen, halfway down, doesn't move, and keeps on printing the message backwards until it fills all top ten lines completely, a total of 640 characters.

Can you modify this new program so it will print a message longer than 25 characters backwards? □

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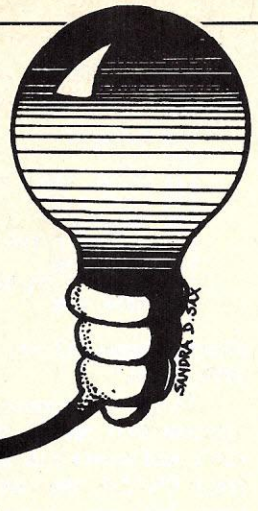
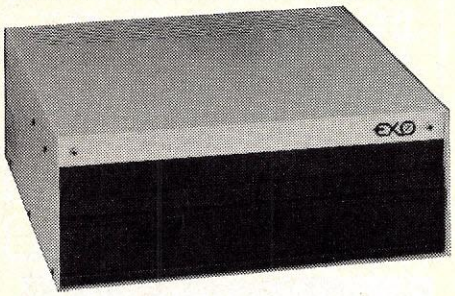


COMPUTERS

NOBUS-Z COMPUTER SYSTEM



Exo Electronics introduces the NoBUS-Z microcomputer system which features a 4 MHz Z80A CPU, CP/M operating system, 64K dynamic RAM, dual density 8 inch disk drives with 600K bytes/side, and 6K color text/graphics. It is designed to support both personal and business applications.

Console configurations range from a keyboard and TV set to separate word-processing display terminals. A full line of printers and hard disks is available. A typical complete 70K system with 600K bytes of disk storage costs under $3000.

Exo Electronics Company, P.O. Box 3571 Culver City, CA 90230. (213) 390-6527.

CIRCLE 251 ON READER SERVICE CARD

VECTOR SYSTEM 2800

Vector Graphic Inc., announces the Vector System 2800, which consists of a Vector 3 terminal with the ZCB single board computer together with 64K of RAM (56K useable) and a disk controller, a Flashwriter II video board featuring an 80 x 24 display.

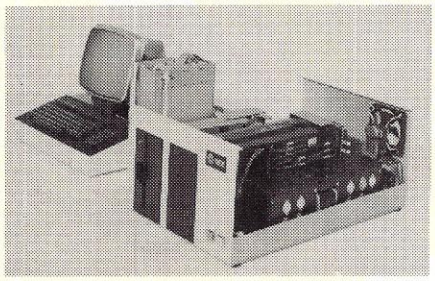
The second major component in the system is the Dualstor 8" drive unit with a total capacity of 2 megabyte-formatted. The formatting is IBM compatible. The standard software on the System 2800 is CP/M. Microsoft Basic-80, Raid debugger, Scope editor, the five Peachtree accounting packages and Memorite Word Management are available options.

Options include the Vector Matrix printer, and the Vector letter quality Qume Sprint 3 printer. $7,295.

Vector Graphic, Inc., 31364 Via Colinas, Westlake Village, CA 91361. (213)991-2303.

CIRCLE 252 ON READER SERVICE CARD

10MB COMPUTER



Systems Engineering Enterpises has developed a computer system which features a one year transferable warranty. System 6789 includes an intelligent terminal with 48K memory, 80 x 24 high resolution video display, 10 MB 8 inch Winchester Disk and a .5 MB double-sided, IBM 3740 compatible floppy.

A multi-user Basic and operating system are standard. Available software includes a data base management system, word processor, integrated general business and medical accounts receivable. $8,500.

Systems Engineering Enterprises, 625 Lofstrand Lane, Rockville, MD 20850. (301) 424-6220.

CIRCLE 253 ON READER SERVICE CARD

TRS-80 EQUIVALENT

Personal Micro Computers, Inc., through an exclusive marketing agreement with a Hong Kong manufacturer, offers a software and hardware compatible equivalent of the Radio Shack Model I, Level II TRS-80. The PMC-80 has a cassette tape recorder, 16K RAM memory, Level II Microsoft Basic interpreter in ROM, power supply, computer and keyboard all in on cabinet.

The PMC-80 will display on either a TV monitor or a standard TV set using a built-in VHF Channel 3 modulator. All software available for the TRS-80 will operate in the PMC-80.

Level II Basic or System cassettes will load in the PMC-80 without volume adjustments. All peripherals designed for the Radio Shack parallel port interface to the PMC-80 50 pin bus through a 40 pin interface adapter.

Disc based programs can be run on the PMC-80 using the Radio Shack Expansion Interface or other commercially available equivalents. With the Expansion Interface, all peripherals designed for the TRS-80 are also compatible with the PMC-80. This includes Winchester disks, speech recognition, printers and RS-232 adapters.

Personal Micro Computer, Inc., 475 Ellis St, Mountain View, CA 94043. (415) 968-1604.

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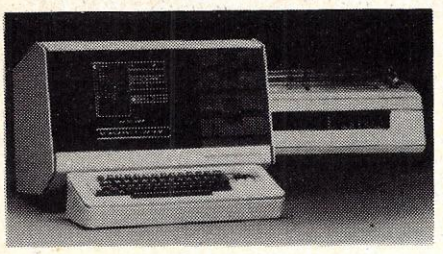


Alpha Professional Systems, Inc. has announced Alphasprint, a desktop microcomputer incorporating word and data processing capabilities. The system includes 64K of main memory, a 45K display buffer, high resolution 12" video display, and two double density 5¼" diskette drives storing over 200 pages of text or 330K of data.

A specially-designed Selectric II-type keyboard incorporates 72 character and function keys, and a full numeric keypad. The optional 660 word-per-minute letter quality printer can be shared by up to three Alphasprints.

The Alphasprint's Pegasus Operating System allows optional communications, WP file merge, and data processing capability. Applications software packages are available as are CP/M, Basic, Fortran, Cobol and Pascal. $4990.

Alpha Professional Systems, Inc., 9465 Wilshire Blvd., Suite 518, Beverly Hills, CA 90212. (213)272-3032.

CIRCLE 255 ON READER SERVICE CARD

SMALL BUSINESS COMPUTER

Information Technology Inc. has designed Superstar a word processor and small business computer. Superstar consists of ITI's Superbrain by Intertec, the NEC Spinwriter, and MicroPro's WordStar word processing software.

Features include: word wrapping, dynamic pagination, two double density 5¼" floppy disk drives, 64K bytes of user-programmable RAM, and printing at 55cps. $7500.

Information Technology Inc., 56 Kearney Rd, Needham, MA 02194. (617) 444-5702.

CIRCLE 256 ON READER SERVICE CARD

MULTI-USER SYSTEM

OSM Computer Corporation has introduced a multi-user, multi-tasking microcomputer system, the OSM Model 6300 computer. Each user has its own CPU, memory and I/O, and shares a common database of disk storage of up to 128 Mbytes, using the industry standard CP/M 2.2 and DPOS/2.

A service processor, consisting of a complete system (Z80A CPU, RAM, I/O) routes all communications from the user processors to the disk database and system printer. The system, which allows up to 128 user terminals is particularly attractive in a word processing environment and for other applications where console speed is critical.

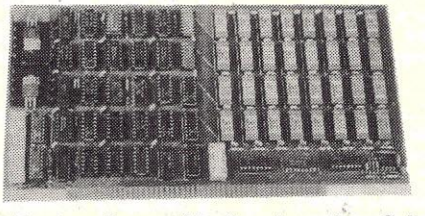
The Model 6300 comes with two 8 inch double density floppy disk drives. Double side is optional. There are several hard disk options available: (1) 32 Mbyte, 64 Mbyte, 96 Mbyte and 128 Mbyte hard disk drive with 16 Mbyte removable on all four sizes and (2) 27 Mbyte fixed drive. The single user mainframe is priced at $5,195.

OSM Computer Corporation 2364 Walsh Ave., Santa Clara, CA 95051. (408) 496-6910.

CIRCLE 257 ON READER SERVICE CARD

MEMORY

64K BYTE MEMORY FOR S-100 COMPUTERS



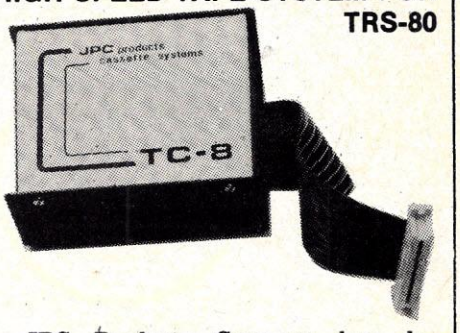
Designed specifically for the Sol, Cromemco, North Star, and other S-100 bus microcomputers is Chrislin Industries' CI-S100 memory module. The dynamic RAM memory module requires no wait states at 2 or 4 MHZ. The new memory is compatible with most S-100 bus microcomputers including the Z80 at 4 MHZ and is designed to plug directly into the memory slots. Features include expandability to a half megabyte with a bank select feature which allows user to select up to eight 64K byte memory cards. $750.

Chrislin Industries, Inc., 31352 Via Colinas #102, Westlake Village, CA 91361. (213) 991-2254.

CIRCLE 258 ON READER SERVICE CARD

DISK & TAPE SYSTEMS

HIGH SPEED TAPE SYSTEM FOR TRS-80



JPC Products Company has developed a High Speed Cassette System for the TRS-80 Level II computer. The system allows the TRS-80 user to load programs five times faster and provides better reliability than the TRS-80 system.

The TC-8 supports the saving, loading, and verifying of Basic programs, system programs, and data files. Features include eight-character named files, the ability to list the directory of all files on a tape, verification of saved files, and a data file storage technique which resembles that of a disk system. The TC-80 is available in kit form for $90 and fully assembled for $120.

JPC Products Company, 12021 Paisano Ct., Albuquerque, NM 87112. (505) 294-4623.

CIRCLE 259 ON READER SERVICE CARD

FIXED/FLOPPY DISK MEMORY SYSTEM FOR TRS-80, APPLE

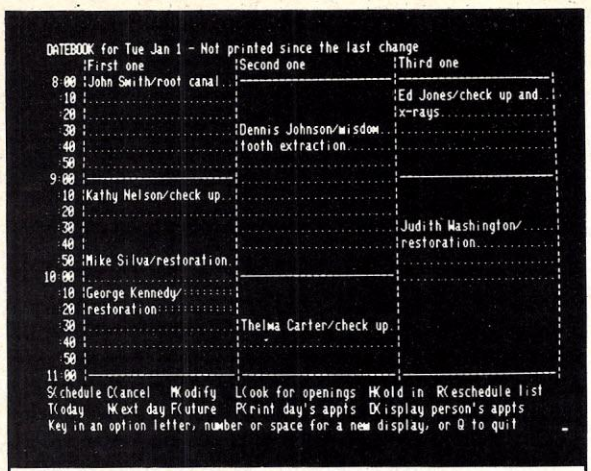
Lobo Drives, International, announces the Model 1850 Dual Fixed/Floppy Disk Memory System for Apple and TRS-80 Model I computers.

The floppy disk drive is the Model 850 and is available in a choice of single or double density configurations. Maximum capacity is 1.6 megabytes. The 8-inch Winchester technology fixed disk drive is a Lobo Drives Model 1000 and is available in a choice of 5 or 10 megabyte capacity.

The two drives also share the same highly-regulated power supply and unique disk controller. Prices range from $3495 to $4695.

Lobo Drives, International, 935 Camino Del Sur, Goleta, CA 93017. (805) 685-4546.

CIRCLE 260 ON READER SERVICE CARD



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ISO-2

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***ISOLATOR (ISO-2) 2 filter isolated 3-prong socket banks; (6 sockets total); integral Spike/Surge Suppression; 1875 W Max load, 1 KW either bank $56.95**

***SUPER ISOLATOR (ISO-3), similar to ISO-1A except double filtering & Suppression $85.95**

***ISOLATOR (ISO-4), similar to ISO-1A except unit has 6 individually filtered sockets $96.95**

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CIRCLE 142 ON READER SERVICE CARD

IS THERE A GAP IN YOUR LIFE ?

GAP General Accounting Package. Fantastic double entry accounting system with user definable accounts. The account numbers are made up of 7 4-digit fields allowing 7 levels of account classifications. With the use of the Operator Report Selector Generator (OSRG), you can generate any type of report you desire, or use report programs in GAP-GL, GAP-AP, and GAP-AR.

GAP-GL Includes all basic GAP functions, plus entry of General Ledger transactions, prints General Journal, General Ledger summary and detail, Balance Sheet, Profit and Loss.

Price $124.95

GAP-AR Requires GAP-GL to run, allows adding A/R invoices, printing Sales Journal, detail A/R report, Account Aging, add/update Cash Receipts with register, Cash Receipts Journal, and A/R Billing.

Price $99.95

GAP-AP Requires GAP-GL to run, allows adding of A/P invoices, printing Purchase Journal, detail A/P report, Aging of Accounts, Check Writing, Check Printing, Cash Disbursements Journal.

Price $99.95

System requirements are 32K CP/M
CP/M is registered trademark of Digital Research

PROFESSIONAL DATA SYSTEMS
318 E 18 St.
Bakersfield CA 93305
(805) 323-0891

CIRCLE 181 ON READER SERVICE CARD

BACKUP SYSTEM FOR Z80A/S-100

The CSSN Backup subsystem is a hardware/software package for the protection of disk-stored data. The off-line storage medium is a 13.4 Mbyte capacity magnetic tape cartridge, making Backup ideal for use with high-capacity Winchester disks. Backup also offers the advantages of file-by-file backup.

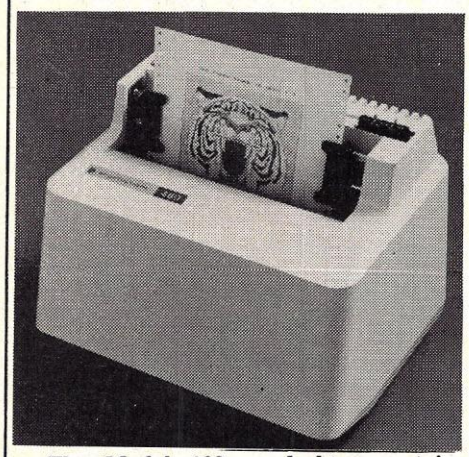
The system includes a Z80A/S-100 compatible interface board, a DEI cartridge tape drive, and a CP/M-compatible software utility, featuring file-by-file Save and Restore commands.

CSSN, 120 Boylston St., 4th Floor, Boston, MA 02116.

CIRCLE 261 ON READER SERVICE CARD

TERMINALS & I/O

PRECISION MATRIX PRINTER



The Model 460, a desktop matrix printer for commercial applications that combines high-quality printing capabilities at throughput speeds of 160 characters per second has been announced by Integral Data Systems, Inc.

It employs a dot matrix character formation technique in which the placement of dots overlaps both horizontally and vertically to achieve correspondence quality printing.

Printing control functions include proportional spacing, enhanced text printing and standard print densities of 10- 12- or 16.7 characters per inch. Other selectable print features include automatic text justification, programmable horizontal and vertical tabbing, reverse paper feed, and "fine positioning" of characters to 1/120th of an inch.

The Model 460 has a standard RS-232C serial interface as well as a Centronics-compatible parallel interface. $1295.

Integral Data Systems, 14 Tech Circle, Natick, MA 01760.

CIRCLE 262 ON READER SERVICE CARD

TWO SPEED/TWO DOT DENSITY GRAPHICS PRINTER

Okidata Corporation has announced a graphics printer, the Slimline SLG. The unit provides a choice of two speed/two dot density printing for alphanumerics in addition to its graphics capability.

High density characters, printed at 120 1pm, are formed using 7 x 9 and 7 x 12 matrices, and low density characters, printed at 400 1pm, with 7 x 5 and 7 x 6 matrices. In graphics mode, it provides a dot density of 100 x 100 dots per inch at a plotting speed of 12 inches per minute. It will reproduce anything that can be displayed on a CRT screen.

The printer is available with Printronix, Centronics and Dataproducts-compatible parallel interfaces and with a microprocessor-controlled RS232 serial interface.

Okidata Corporation, 111 Gaither Dr., Mount Laurel, NJ 08054. (609) 235-2600.

CIRCLE 263 ON READER SERVICE CARD

MATRIX PRINTER FOR SMALL BUSINESS

A full feature matrix printer, designed for the small business computer and advanced computer hobbyist markets, has been announced by MQI Computer Products.

The MQI 150 has a speed of 150 cps, bi-directional logic seeking. The unit is a 100 percent duty cycle printer with minimum head life of 200 million characters. The user may select 80, 132 or 136 columns; 6 or 8 lines per inch, and the matrix is 9 x 9, upper and lower case with descenders.

The MQI 150 will accommodate multi-part forms up to original plus-five copies, from 2" to 15" in width. $1295.

MQI Computer Products, 18381 Bandilier Circle, Fountain Valley, CA 92708.

CIRCLE 264 ON READER SERVICE CARD

COLOR GRAPHICS TERMINALS

Intelligent Systems Corp. has announced the availability of its Intecolor 8300 and 8900 series product lines which include cost effective, color graphic terminals, desk-top computers and small business systems.

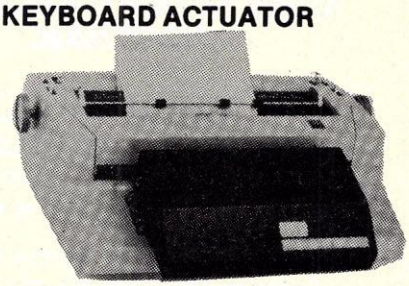
The desk-top computers are available with 5 inch, 8 inch and hard disk units that offer a storage range from 80K bytes to 26 megabytes. Both products feature standard resolution color graphics (160 x 192) with high resolution color graphics (480 x 384) as an available option.

CP/M is available on the desk-top computers along with color word processing capability.

Intelligent Systems Corp., 5965 Peachtree Corners East, Norcross, GA 30071 (404) 449-5961.

CIRCLE 265 ON READER SERVICE CARD

KEYBOARD ACTUATOR



Kogyosha announces the KGS-80 Keyboard Actuator, designed to turn an IBM Selectric typewriter, or its equivalent, into a printer for the TRS-80.

The KGS-80 is positioned on the keyboard, and plugged into the expansion interface, or directly into the CPU using the interface cable. It does not require any software to operate. All memory space is available, making it compatible with Electric Pencil, Scripsit and other word processing programs. $599.

Kogyosha USA Office, 179 Riveredge Rd., Tenafly, NJ 07670. (201) 569-8769.

CIRCLE 266 ON READER SERVICE CARD

HEAVY-DUTY DOT MATRIX PRINTER

The Model 3431 is a heavy-duty, 150 cps dot matrix printer from TEI, Inc. It offers up to 136-column printing using a 9 x 7 dot format to form 94 ASCII characters, including lowercase letters with descenders, symbols, double-wide characters, and bidirectional printing under microprocessing control.

The pin-feed tractor accepts continuous forms from 1.5" to 14". The model 3431 is available with standard parallel interface or optional RS-232C serial interface. $1,695

TEI, Inc., 5075 S. LoopE., Houston TX 77033. (713) 738-2300.

CIRCLE 267 ON READER SERVICE CARD

BUSINESS · PROFESSIONAL · GAME SOFTWARE FOR APPLE AND TRS-80

☐ HOME FINANCE PAK I: Complete package $49.95 Apple, TRS-80

☐ **BUDGET:** The heart of a comprehensive home finance system. Allows user to define up to 20 budget items. Actual expense input can be by keyboard or by automatic reading of CHECKBOOK II files. Costs are automatically sorted and compared with budget. BUDGET produces both monthly actual/budget/variance report and a year-to-date by month summary of actual costs. Color graphics display of expenses. . .$24.95

☐ **CHECKBOOK II:** This extensive program keeps complete records of each check/deposit. Unique check entry system allows user to set up common check purpose and recipient categories. Upon entry you select from this pre-defined menue to minimize keying in a lot of data. Unique names can also be stored for completeness. Rapid access to check files. Check register display scrolls for ease of review. 40 column printout. Up to 100 checks per month storage. Files accessible by BUDGET program $19.95

☐ **SAVINGS:** Allows user to keep track of deposits/withdrawals for up to 10 savings accounts. Cpmplete records shown via screen or 40 column printer. $14.95

☐ **CREDIT CARD:** Keep control of your cards with this program. Organizes, stores and displays purchases, payments and service charges. Screen or 40 column printer display. Up to 10 separate cards $14.95

☐ THE UNIVERSAL COMPUTING MACHINE: $39.95 Apple, TRS-80

A user programmable computing system structured around a 20 row x 20 column table. User defines row and column names and equations forming a unique computing machine. Table elements can be multiplied, divided, subtracted or added to any other element. User can define repeated functions common to a row or column greatly simplifying table setup. Hundreds of unique computing machines can be defined, used, stored and recalled, with or without old data, for later use. Excellent for sales forecasts, engineering design analysis, budgets, inventory lists, income statements, production planning, project cost estimates-in short for any planning, analysis or reporting problem that can be solved with a table. Unique curser commands allow you to move to any element, change its value and immediately see the effect on other table values. Entire table can be printed by machine pages (user-defined 3-5 columns) on a 40 column printer. Transform your computer into a UNIVERSAL COMPUTING MACHINE.

☐ COLOR CALENDAR: HI-RES color graphics display of your personal calendar. Automatic multiple entry of repetitive events. Review at a glance important dates, appointments, anniversaries, birthdays, action dates, etc. over a 5 year period. Graphic calendar marks dates. Printer and screen display a summary report by month of your full text describing each day's action item or event. Ideal for anyone with a busy calendar . . (Apple Only) $19.95

☐ BUSINESS SOFTWARE SERIES: Entire package $199.95 Apple, TRS-80

☐ **MICROACCOUNTANT:** The ideal system for the small cash business. Based on classic T-accounts and double-entry bookkeeping, this efficient program records and produces reports on account balances, general ledger journals, revenue and expenses. Screen or 40 column printer reports. Handles up to 500 journal entries per period, up to 100 accounts. Instructions include a short primer in Financial Accounting. $49.95

☐ **UNIVERSAL BUSINESS MACHINE:** This program is designed to SIMPLIFY and SAVE TIME for the serious businessman who must periodically Analyze, Plan and Estimate. The program was created using our Universal Computing Machine and it is programmed to provide the following planning and forecasting tools.

CASH FLOW ANALYSIS	PROFORMA BALANCE SHEET	SOURCE AND USE OF FUNDS
PROFORMA PROFIT & LOSS	SALES FORECASTER	JOB COST ESTIMATOR

Price, including documentation and a copy of the base program. Universal Computing Machine. $89.95

☐ **INVOICE:** Throw away your pens. Use the ELECTRONIC INVOICE facsimile displayed on your CRT. The program prompts and you fill in the data. Includes 3 address fields (yours, Bill to and Ship to), Invoice No., Account No., Order No., Salesman, Terms, Ship Code, FOB Pt. and Date. Up to 10 items per sheet with these descriptions: Item No., No. of units, Unit Price, Product Code, Product Description, Total Dollar amount per item and invoice total dollar amount. Generates, at your option, hard copy invoices, shipping memos, mailing labels, audit copies and disc updates to master A/R files. (48K) $49.95

☐ **BUSINESS CHECK REGISTER:** Expanded version of the Checkbook II program. Handles up to 500 checks per month with complete record keeping. (48K) $29.95

☐ **BUSINESS BUDGET:** As described above and companion program to Business Check Register. Handles 500 transactions per month, up to 20 cost categories. Accesses BCR files for actual costs. (48K) $29.95

☐ ELECTRICAL ENGINEERING SERIES: Both programs $159.95 Apple

☐ **LOGIC SIMULATOR:** SAVE TIME AND MONEY. Simulate your digital logic circuits before you build them. CMOS, TTL, or whatever, if it's digital logic, this program can handle it. The program is an interactive, menu driven, full-fledged logic simulator capable of simulating the bit-time by bit-time response of a logic network to user-specified input patterns. It will handle up to 1000 gates, including NANDS, NORS, INverters, FLIP-FLOPS, SHIFT REGISTERS, COUNTERS and user-defined MACROS. Up to 40 user-defined, random, or binary input patterns. Simulation results displayed on CRT or printer. Accepts network descriptions from keyboard or from LOGIC DESIGNER for simulation. Specify 1000 gate version (48K required) or 500 gate version (32K required) $89.95

☐ **LOGIC DESIGNER:** Interactive HI-RES Graphics program for designing digital logic systems. A menu driven series of keyboard commands allows you to draw directly on the screen up to 15 different gate types, including 10 gate shape patterns supplied with the program and 5 reserved for user specification. Standard patterns supplied are NAND, NOR, INVERTER, EX-OR, T-FLOP, JK-FLOP, D-FLOP, RS-FLOP, 4 Bit COUNTER and N-BIT SHIFT REGISTER. User interconnects gates just as you would normally draw using line graphics commands. Network descriptions for LOGIC SIMULATOR generated simultaneously with the CRT diagram being drawn. Drawing is done in pages of up to 20 gates. Up to 50 pages (10 per disc) can be drawn, saved and recalled. Specify 1000 gate (48K) or 500 gate (32K) system $89.95

☐ MATHEMATICS SERIES: Complete Package $49.95 Apple only

☐ **NUMERICAL ANALYSIS:** HI-RES 2-Dimensional plot of any function. Automatic scaling. At your option, the program will plot the function, plot the INTEGRAL, plot the DERIVATIVE, determine the ROOTS, find the MAXIMA and MINIMA and list the INTEGRAL VALUE. For 16K $19.95

☐ **MATRIX:** A general purpose, menu driven program for determining the INVERSE and DETERMINANT of any matrix, as well as the SOLUTION to any set of SIMULTANEOUS LINEAR EQUATIONS. Disk I/O for data save. Specify 55 eqn. set (48K) or 35 eqn. (32K) $19.95

☐ **3-D SURFACE PLOTTER:** Explore the ELEGANCE and BEAUTY of MATHEMATICS by creating HI-RES PLOTS of 3-dimensional surfaces from any 3-variable equation. Disc save and recall routines for plots. Menu driven to vary surface parameters. Demos include BLACK HOLE gravitational curvature equations. . $19.95

☐ ACTION ADVENTURE GAMES SERIES: Entire series $29.95 Apple only

☐ **RED BARON:** Can you outfly the RED BARON? This fast action game simulates a machine-gun DOG-FIGHT between your WORLD WAR I BI-PLANE and the baron's. You can LOOP, DIVE, BANK or CLIMB in any one of 8 directions - and so can the BARON. in HI-RES graphics $14.95

☐ **BATTLE OF MIDWAY:** You are in command of the U.S.S. HORNETS' DIVE-BOMBER squadron. Your targets are the Aircraft carriers, Akagi, Soryu and Kaga. You must fly your way through ZEROS and AA FIRE to make your DIVE-BOMB run. In HI-RES graphics $14.95

☐ **SUB ATTACK:** It's April, 1943. The enemy convoy is headed for the CORAL SEA. Your sub, the MORAY, has just sighted the CARRIERS and BATTLESHIPS. Easy pickings. But watch out for the DESTROYERS - they're fast and deadly. In HI-RES graphics $14.95

☐ **FREE CATALOG**—All programs are supplied in disc and run on Apple II w/Disc & Applesoft ROM Card & TRS-80 Level II and require 32K RAM unless otherwise noted. Detailed instructions included. Orders shipped within 3 days. Card users include card number. Add $1.50 postage and handling with each order. California residents add 6½% sales tax. Make checks payable to:

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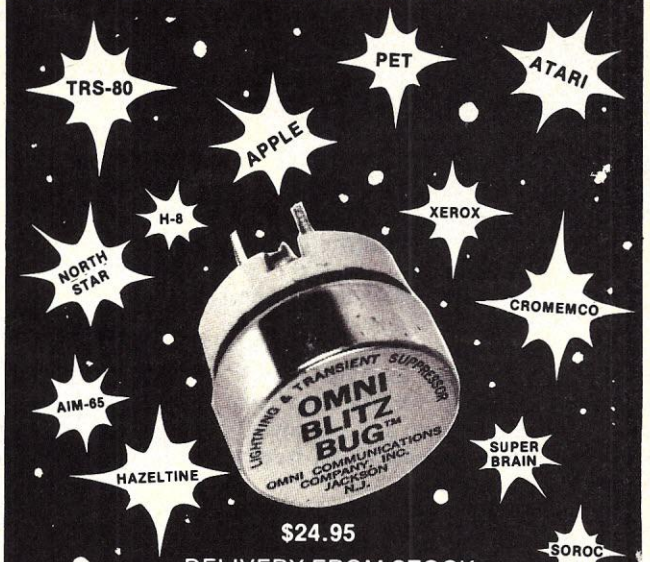

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CIRCLE 174 ON READER SERVICE CARD

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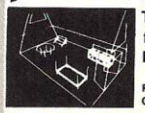
APPLE/PET BREAKTHROUGHS

"Precise, humanized, well documented an excellent value" are the applauds now being given to United Software's line of software. These are sophisticated programs designed to meet the most stringent needs of individuals and business professionals. Every package is fully documented.

APPLE WORLD

By Paul Lutus

3-D ANIMATED COLOR GRAPHICS



The Program made famous on National TV!

FOR 48K APPLE II COMPUTERS WITH DISK

APPLE WORLD turns your Apple into a sophisticated graphics system capable of creating animated three-dimensional color images, projecting them in true perspective on the screen, rotate them, move them closer, further away, and many other exciting and imaginative things.

A powerful screen-oriented text editor is included to facilitate image formation. This program was recently featured on Tom Snyder's Prime Time Saturday TV Show and is now available for sale.

APPLE WORLD'S powerful editor is so easy to use that children will love it. You can now "sketch" your dream house, boat, car, or fantasy empire. Then view it as it would be seen from 10,000 feet, or you can ZOOM in until the screen is filled with a doorknob. You could then go inside and move from room to room examining furniture placement as your screen rotates within the room. Images or specific parts of images can easily be saved to disk or printer.

Does all this sound like science fiction? You won't think so after you have visited **Apple World.**

Introductory Price $59.95

36 page manual included

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By Ken Germann

KEYED RANDOM ACCESS METHOD

Many times more powerful and efficient than the primative "relative record" method used by Apple & Commodore.

FOR APPLE II & COMMODORE PET

KRAM is the **FASTEST** and **MOST POWERFUL** keyed access method available for the Apple & Commodore CBM (Pet) Computers. Written entirely in 6502 machine code, **KRAM** is extremely fast, comprehensive in scope, very compact, and easy to use. **KRAM** function calls are invoked via a single instruction.

Using the sophisticated capabilities of **KRAM** the Apple& CBM (Pet) can now fully meet the requirements of information management applications, such as: Accounts Receivable/Payable, Inventory Control, General Ledger, Payroll, Mailing lists, and Database Management. Programs can now be 30% to 90% shorter and run many times faster! Less experienced users can now create powerful programs!

KRAM Release 2.0 Functions:

- Create/Open a dataset
- Put record by Key
- Add & delete records by Key
- Get any record by Full/Partial key in 4/10ths of a second (2/10ths with Corvus Disk)
- Supports multiple disks
- Read next or previous record
- Dynamic space allocation
- Dynamic space reclamation
- Dynamic index compression
- Never needs file reorganization!

An 87 page manual fully documents **KRAM** 2.0 detailing **KRAM** functions and illustrating with programming samples. **KRAM** architecture is fully explained and a sample mailing list application program is included.

PET & Apple Requirements

KRAM is designed to work with both Apple's Disk II, or Corvus Systems 10 Megabyte Winchester Disk, and Commodores 2040, 3040, and 8050 Disk units. **KRAM 2.0** requires an integer Apple or Apple Plus with integer card and at least one disk drive. **KRAM** works on any 40/80 column 16K/32K PET.

Introductory Special $99.95

FOR COMMODORE 16K/32K COMPUTERS

DATABASE MANAGEMENT SYSTEM — A comprehensive, interactive system like those run on mainframes! Six modules comprising 42K of programming allow you to create, edit, delete, display, print, sort, merge, etc., etc. - databases of up to 10,000 records. Printer routines automatically generate reports and labels on demand. 60 pages of concise documentation are included. Requirements – 16-32K PET and 2040 Dual Disk (printer optional) . . . . . **COST $125**

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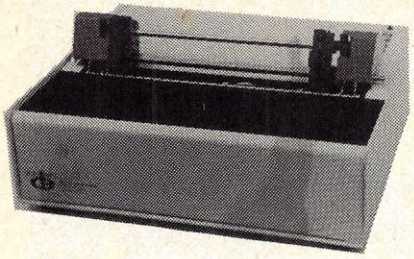
CIRCLE 203 ON READER SERVICE CARD

IMPACT PRINTER WITH GRAPHICS



The 80 column DE-800SG dot matrix printer features full dot graphics and complete microprocessor control. The standard version also includes tractor feed, a 2K character buffer, hardware UART, aluminium case, and the ability to store a complete screen display from a standard video terminal.

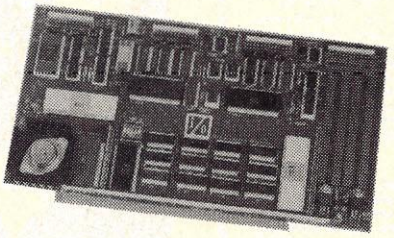
The unit accepts paper widths from 1.5" to 10" and will print up to 5-part forms. Switch and software selectable option bits control the baud rate and forms length. The interface is RS-232C and 20 MA. Baud rate is programmable from 110 to 9600. $995.

Data Electronic Devices, Inc., 18 Bridge St., Salem, NH 03079. (603) 893-2047.

CIRCLE 268 ON READER SERVICE CARD

MULTI-FUNCTION S-100 I/O BOARD

New from I/O Technology is a multi-function S-100 I/O board. It has two serial ports Asyn/Sync (RS-232, current loop or TTL) with individual crystal controlled programmable baud rate generators. Four 8-bit parallel ports are available; one is an 8-bit latched input port while the other three 8-bit ports can be programmed in combinations of input, output or bidirectional.



The board is said to be ideal for controller applications and has an 8-level programmable interrupt controller with auto restart (8080/Z80). An interconnection is available. $375.

I/O Technology, 29119 Flowerpark Dr., Canyon Country, CA. 91351 (805) 252-7666.

CIRCLE 269 ON READER SERVICE CARD

PERIPHERALS

SPEECH RECOGNITION UNIT

The first low-cost, industry-compatible speech recognition unit, making available speech input capability with virtually every computer terminal, has been introduced by Heuristics, Inc. The Heuristics 7000 will interface with all RS-232-C terminals to provide the advantages of hands-off operation.

The unit can be trained to recognize up to 64 words or phrases, each up to three seconds in length, and is compatible with all common programming languages, such as Fortran, Cobol, Pascal, and Basic. It can be trained or re-trained as often as necessary to accept the voices of the users, and will automatically reject utterances significantly different from the vocabulary set. Rejection levels can be adjusted by the users. $3000.

Heuristics, Inc. 1285 Hammerwood Ave., Sunnyvale, CA 94086. (408) 734-8532.

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APPLE-SALE! 40 Games for $85.00

That's right, 40 games and programs for your apple computer for only $85.00. You will receive 3 disks-loads of family fun that will entertain you for yours. Send $85.00 to:

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TV TYPER...turns your Apple into a TVT. (Applesoft ROM, req. 48K) $19.95

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PET 2022 Printer (trac feed)	$ 795	$100

KIM-1 $159 (Add $30 for Power Supply) SYM-1 $ 209.00
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Add $1 per order for UPS shipping.
Ask for 6502, TRS-80, and S-100 Product List.

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CIRCLE 103 ON READER SERVICE CARD

SCIENCE MATH STATISTICS
ASTRONOMY MUSIC FINANCE
Professionally written TRS-80* Software

Star Finder $9.00 — Curve Fitter $12.00
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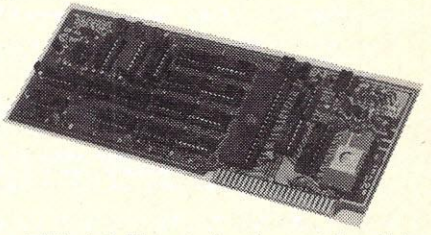
*TRS-80 is a trademark of Tandy Corporation

CIRCLE 176 ON READER SERVICE CARD

VIDEO DIGITIZER FOR APPLE

The Micro Works DS-65 Digisector, a random access video digitizer for the Apple II, converts a TV camera's output into digital information the Apple can process.



This intelligent Apple peripheral has on-board software in 2708 EPROM, featuring: full screen scans directly to Apple Hi-Res screen; random-access digitizing by Basic programs; line-scan digitizing for reading charts or tracking objects; utility functions for clearing and copying the Hi-Res screen. $349.95

The Micro Works, P.O. Box 1110, Del Mar, CA 92014, (714) 942-2400.

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35 basic functions + 8 edit commands! Single step or Multiple step. Automatic trace of logic flow with printing of trace, trace of instructions greater than stack pointer values, and rapid trace. Subroutine calling. Automatic program looping. Dynamic disassembly of instructions!!!

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Build directory of directories!! Sorts by disk or by program. Abbreviated or full form — full form includes dates of creation and last update, and other directory data.
Wild card select options with masks. Build consolidated directory of all GL#?/BAS files. Select on filename and extension.
Save or load XDIR catalog files.
Concatenate new data with loaded file.

Extended Copy (XCOPY)
Copies multiple files with a single command using masked select options! Source disk may be non-operating system disk. Single drive capability. Recover bad files — invalid sectors itemized but copy continues.
Merge files with or without replacement.

Superzap (SZAP)
Display or print and modify standard TRSDOS diskette track and sector data. Full screen edit mode. Automatic repeat scan and print. Copy disk sectors — any number of sectors to same or other drive.

Directory Fix (DFIX)
Automatic repair of HIT tables! List and flag directory errors.

Disk Identification (DISKID) Change diskette names!

Extended Create (XCREATE) Creates and initializes file to end.

DOCUMENTATION
Complete documentation of above utilities including a full discussion on recovery of lost data on diskettes!!!

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CIRCLE 188 ON READER SERVICE CARD

SYSTEMS SOFTWARE

LANGUAGES

OmniForth, a high-level language modeled on fig-Forth, is available for North Star computers. It contains the interactive Forth compiler, assembler for the 8080 plus Z80, file system and text editor, and requires 24K memory and North Star DOS. $49.95. Interactive Computer Systems, Inc., 6403 DiMarco Rd., Tampa, FL 33614.

CIRCLE 272 ON READER SERVICE CARD

Tiny Pascal for the PET and Apple II includes the Line Editor, which allows the user to create, modify and save source language statements; the Compiler, which translates the source statements into an intermediate P-code that is ready for execution; and the Interpreter, which executes the P-code by turning the PET or Apple II into a pseudo 16-bit stack computer. $35. Abacus Software, P.O. Box 7211, Grand Rapids, MI 49510.

CIRCLE 273 ON READER SERVICE CARD

Business Basic from Optimized Systems Software includes all the features of OSS Basic plus several extensions, including Print Using, a statement which provides the ability to format a number, left or right justify a string and print any format character using an escape feature. $84.95. Optimized Systems Software, Shepardson Microsystems, Inc., 20395 Pacifica Dr., Suite 108, Cupertino, CA 95014. (404) 257-9900.

CIRCLE 274 ON READER SERVICE CARD

Folio is a file-oriented language designed for applications which require extensive data manipulation. It features a pseudo code interpreter written in 6502 machine language. $25. Michael Allen, 6025 Kimbark, Chicago, IL 60637.

CIRCLE 275 ON READER SERVICE CARD

Microsoft announces version 4.0 of its **Cobol-80** compiler for 8080, 8085 and Z80 based computers. Features new to this version are full screen interactive Accept/Display and Screen Section compatible with Data General interactive Cobol, Chain with argument passing and segmentation to ANSI standard Level I. $750. Microsoft, 10800 NE 8th, Suite 819, Bellevue, WA 98004. (206) 455-8080.

CIRCLE 276 ON READER SERVICE CARD

SYSTEMS

Apple Computer, Inc. has announced **DOS 3.3**, an improved disk operating system for its Disk II floppy disk subsystem. Owners of Disk II drives with a prior version of DOS can convert with a DOS 3.3 Kit. $60. Also announced was DOS Toolkit, a software development tool that allows users to write source code in 6502 assembly language and facilitates Applesoft and graphic program development. $75. Apple Computer Inc., 10260 Bandley Dr., Cupertino, CA 95014.

CIRCLE 277 ON READER SERVICE CARD

The **Small-C Compiler** is now available to CP/M users on single density 8" diskette. The compiler supports a significant subset of the C programming language and provides an interface to assembly language with its "#asm... #endasm" feature. $15. The Code Works, Box 550, Goleta, CA 93017. (805) 967-0905.

CIRCLE 278 ON READER SERVICE CARD

Trace is a 6502 machine language debugging tool for Ohio Scientific computers. Availabe on 8" diskette, it can be used to debug software under development or to analyze the operation of programs in ROM or RAM. $99. Pegasus Software, P.O. Box 10014, Honolulu, HI 96816. (808) 732-6897.

CIRCLE 279 ON READER SERVICE CARD

InfoSoft Systems, Inc. introduces **I/OS**, a basic operating system for 8080, 8085 and Z80 disk-based CPUs. It is designed for use with up to 15 hard or floppy disk units and has a file capacity exceeding 268 million bytes. $150. InfoSoft Systems, Inc., 25 Sylvan Rd. S., Westport, CT 06880. (203) 226-8937.

CIRCLE 280 ON READER SERVICE CARD

CP/M2 for the TRS-80 Model II features 12 million bytes of mass storage. A menu driven configuration program allows total control of the parallel printer port and both serial ports. An ADM-3A emulation program is included which allows the TRS-80 to be used as a terminal through the serial ports. $170. Lifeboat Associates, 1651 Third Ave., New York, NY 10028.

CIRCLE 281 ON READER SERVICE CARD

APPLICATIONS SOFTWARE

BUSINESS

The **Investment Data System**, designed to develop a data base for computer analysis of investments, will create, update and display data digitized from charts of stocks and commodities. It is written for the Apple II with disk drive and uses either the Talos or Apple graphics tablet. $120. Urban Aggregates Inc., 6431 Brass Knob, Columbia, MD 21044.

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And when you need them: Memory Modules—plug-in modules for storing programs and data; an "extra smart" Card Reader; a Printer that prints upper and lower case alpha plus special characters and does high resolution plotting; the Wand to input programs in bar code form (available early 1980); Application Modules—preprogrammed, plug-in modules that give solutions to a wide range of problems.

The HP-41C lets you reassign any standard function, any programs you've written, or programs provided in the Application Modules—to any keyboard location you want. And of course Hewlett-Packard backs the HP-41C with total software support including an Owner's Manual and thousands of programs in the HP-41C Applications Pacs, Solutions Books, and the HP Users' Library.

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INFORMATION MASTER runs on 8080 or Z-80 microcomputers using a CP/M compatible operating system and having at least two disk drives and 32K of memory. Disk formats available: 8" single density, Vector Graphic 5", Heath H-89 5" (modified CP/M).

INFORMATION MASTER program is shipped ready to run, on disk with demonstration data base and 22 page users manual.

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CIRCLE 143 ON READER SERVICE CARD

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C Compiler for CP/M*

New, and available now! An easily affordable compiler incorporating most of the features of the full C language.

BD SOFTWARE

System requirements: CP/M and at least 24K of RAM

Variable Types: char, int, unsigned

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Pointers: to variables, structures, unions and functions

Features: is a structured language, all functions (Programs) recursive; more powerful expression operators than any other von Neumann type language; allows free-formatted source; close enough to UNIX** C to make conversions feasible.

Speed: On 2 MHz 8080, the statement
for (i = 1; i < 30000; i++) x = 5;
takes about 4 seconds to execute.

Package contains: compiler, linker, library manager; standard function library; sample source files include games, a terminal emulator with disk I/O plus the source for many standard library functions; BDS C User's Guide; Book—*The C Programming Language* by Dennis Ritchie and Brian Kernighan of Bell Labs.

Price: $125
Manual Alone $20

Recipient of the Computer Lib Seal of Approval

*CP/M is a trademark of Digital Research Corp.
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Prices reflect distribution on 8" single density diskettes. If a format is requested which requires additional diskettes, a surcharge of $8. per additional diskette will be added.

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CIRCLE 196 ON READER SERVICE CARD

Xcel Computer Systems announces custom made **Mailing List** programs for the PET, CBM, Apple and TRS-80 computers. The user specifies the type of data to be stored, the format of the record and the information to be printed on the label. The programs use a true random access system and require a printer and floppy disk. Prices start at $80. Xcel Computer Systems, Box 28, Williamsbridge Station, Bronx, NY 10467.

CIRCLE 283 ON READER SERVICE CARD

Apple Plot is a software package which enables users of Apple computers to create, revise and print detailed charts and graphs. When used with a color television monitor, information being plotted may be displayed in color. It gives the user a choice of six graphic formats: line, multiline, bar, multibar, bar with line overlay and scattergraph. Information can be entered manually through the computer keyboard or from an external program. $70. Apple Computer Inc., 10260 Bandley Dr., Cupertino, CA 95014.

CIRCLE 277 ON READER SERVICE CARD

Intelligent Systems Corp. has announced two color business programs for the Intecolor desk-top computer running under CP/M. **Execugraph** is a series of color graphic management information system programs. Also included are statistical tools for forecasting and data analysis. **Color Graphic Accounting** uses color and graphics in the interpretation and display of accounting records generated through the standard accounting functions of general ledger, accounts receivable, accounts payable, payroll, sales analysis and inventory control. Intelligent Systems Corp., 5965 Peachtree Corners East, Norcross, GA 30071. (404) 449-5961.

CIRCLE 284 ON READER SERVICE CARD

Order Entry from Compumax has the ability to generate and print purchase orders and sales orders in mailable format, compute tax on taxable orders, register deliveries against outstanding purchase orders and shipments against outstanding sales orders, and complete purchase and sales order history reports. It is available for Micropolis 1053/II (48K), Apple II, PET (DOS 2.0) and Microsoft under CP/M. Compumax, P.O. Box 1139, Palo Alto, CA 94301. (415) 321-2881.

CIRCLE 285 ON READER SERVICE CARD

Labelmaker for the TRS-80 is designed to allow the user to start a small home business maintaining mailing lists and supplying gummed mailing labels to customers. All names in memory can be sorted alphanumerically or by zip code in less than ten seconds. Names can be coded and printed selectively. The program requires at least one disk drive and a minimum memory of 32K. $99.50. The Peripheral People, P.O. Box 524, Mercer Island, WA 98040. (206) 232-4505.

CIRCLE 286 ON READER SERVICE CARD

A-T Enterprises has announced an **Income Property Management** software package for the TRS-80 Model II. The interactive system is a full general ledger system that keeps track of all income and expenses providing fully formatted financial statements, management reports and exception reports. Written in CBasic and running under CP/M, it requires 48K of RAM, two 8" disk drives and a printer. $650. A-T Enterprises, 221 North Lois, La Habra, CA 90631. (213) 947-2762.

CIRCLE 287 ON READER SERVICE CARD

The **Buyers/Sellers Analysis Program** for TRS-80 Model I and II allows brokers and agents to compute loan payments, closing costs, maximum loans, down payments, amortization schedules, second trust deeds and seller's net proceeds. A terminal feature allows the computer to be used in place of a rented terminal. The Real Estate Systems Group, 484 Lovers Lane, Vacaville, CA 95688. (707) 422-4751.

CIRCLE 288 ON READER SERVICE CARD

EDUCATIONAL

Apple Pilot is a high-level programming language system that facilitates computer-aided instruction for educators and corporate and industrial trainers. In Author mode the instructor creates a lesson using one or more of four editors. In Lesson mode the student runs the lesson diskette, material is presented and student responses are accepted exactly as specified by the teacher/trainer. It will run on Apple II or Apple II Plus with a minimum of 48K bytes of user memory. $150. Apple Computer Inc., 10260 Bandley Dr., Cupertino, CA 95014.

CIRCLE 277 ON READER SERVICE CARD

Grading System Programs for the Apple II is designed to help school administrators and teaching professionals keep track of grades, cumulative averages and school credits. It allows the orderly input of reporting period grades and the automatic preparation of report cards and honor roll lists for up to 600 students per diskette. The system is written in Applesoft and requires a single disk drive and an 80-column printer. $199.95. Charles Mann & Associates, Micro Software Division, 7594 San Remo Trail, Yucca Valley, CA 92284. (714) 365-9718.

CIRCLE 289 ON READER SERVICE CARD

T.H.E.S.I.S. has introduced five educational programs on cassette for the Atari 800. These include **Guessword** for grades 6 and above, **Fishing for Homonyms** for grades 3 to 6, **Wanted** for grades 4 to 8, **Word-mate**, for grades 3 to 6, and **Word Scramble** for grades 1 to 4. T.H.E.S.I.S., P.O. Box 147, Garden City, MI 48141. (313) 595-4722.

CIRCLE 290 ON READER SERVICE CARD

Chemistry Lab Simulation #1 and #2 for the Apple II provide dynamic and colorful simulations of high school and college level chemistry lab experiments. Lab #1 uses high-resolution graphics to simulate introductory level chemistry experiments. Lab #2 visually illustrates the dynamic behavior of gas particles as the user varies the gas environment. High Technology, Inc., Software Department, P.O. Box 14665, Oklahoma City, OK 73113. (405) 840-9900.

CIRCLE 291 ON READER SERVICE CARD

Micro-Ed has announced a series of **educational programs** for the PET designed to raise student scores on the Iowa Tests of Basic Skills. Micro-Ed, Inc., Box 24156, Minneapolis, MN 55424.

CIRCLE 292 ON READER SERVICE CARD

A K-8 **Math Program** designed for use in a classroom environment to supplement regular instruction is now available for use with the TRS-80. It is supplied on five cassettes and three disks in a binder with a teacher's manual containing instructions and sample record keeping forms. It requires a 16K Level II TRS-80 system (disk drive optional). $199. Available from participating Radio Shack stores and dealers and Radio Shack Computer Centers.

CIRCLE 293 ON READER SERVICE CARD

UTILITIES & MISC.

The Voice gives the Apple II or Apple II Plus the power of speech. Each data disk can store up to 80 words or phrases which can be sorted for quick reference. It allows the user to speak from any Basic program by using Print commands. $39.95. Muse Software, 330 N. Charles St., Baltimore, MD 21201. (301) 659-7212.

CIRCLE 294 ON READER SERVICE CARD

Quality Software announces the **QS Smart Terminal** program, a Z80 machine language program that permits the user to communicate with other computers and timesharing networks. Incoming data may be stored in any one of nine files in RAM. Files, including programs, may be saved to or loaded from cassette, listed on the video, printed, transmitted out through a modem and created or edited with an onboard text editor. $49.95. Quality Software, 6660 Reseda Blvd., Suite 105, Reseda, CA 91335. (213) 344-6599.

CIRCLE 295 ON READER SERVICE CARD

MenuBldr, written in North Star Basic permits a user to generate screen menus in 2 to 3 minutes. The program stores the menu control values, menu title and menu text on a disk. $48. American Planning, 4600 Duke St., Suite 425, Alexandria, VA 22304.

CIRCLE 296 ON READER SERVICE CARD

Datacope **Text File Copy** augments Apple's DOS 3.2 by providing a way to copy a Basic text file from one disk to another. The program automatically repairs defective records while copying random-access files and notes the record locations for further action by the operator. $34.95. Datacope, P.O. Drawer AA, Little Rock, AR 72205.

CIRCLE 297 ON READER SERVICE CARD

Programmer by Rational Software is said to provide professional-quality programming tools to users of TRS-80 Level II Basic. After the machine language routine is read once, all five functions--renumber, append, pack, delete and move--are available continuously. $25. Rational Software, 963 East California Blvd., Pasadena, CA 91106.

CIRCLE 298 ON READER SERVICE CARD

Structured Basic Translator is a disk-based programming utility for the TRS-80 Level II. The programmer writes a structured program using a text editor. The program then converts the file into an executable Basic program. $29.95. Acorn Software, Inc., 634 North Carolina Ave., SE, Washington, DC 20003. (202) 544-4259.

CIRCLE 299 ON READER SERVICE CARD

Dakin5 offers a twelve-program **utility package** which contains Apple's DOS 3.3. The package requires an Apple II or Apple II Plus with 48K, two disk drives and a printer. $70. Dakin5 Corporation, P.O. Box 21187, Denver, CO 80221.

CIRCLE 301 ON READER SERVICE CARD

Reloc is a Z80 relocation routine that allows users to position utilities at an address of their choosing by selecting either ending or beginning addresses in either hex or decimal. $29.95. The Alternate Source, 1806 Ada St., Lansing, MI 48910.

CIRCLE 302 ON READER SERVICE CARD

Chat is an intelligent terminal program for the OSI C1-P/Superboard, which allows cassette storage of received data and direct transmissions of data from cassette. $24.95. Charles A. Shartsis, 9308 Cherry Hill Rd. #812, College Park, MD 20740.

CIRCLE 303 ON READER SERVICE CARD

Hanson House announces **Swiss-Cheese**, a utility for formatting program listings which will automatically produce a page listing, both in the number of lines and the width of line, via user entry. $9.95. Hanson House, Dept. 34, 55 Hanson Pl., Stratford, CT 06497.

CIRCLE 304 ON READER SERVICE CARD

A **Machine Language Debug Package** for the Compucolor II allows the execution of a program to be halted at any point so that the state of the registers and memory can be noted or altered. It can manipulate machine registers, obtain a hex dump of memory, alter memory to a numeric or character value, disassemble memory to mnemonics, enter mnemonics which are immediately assembled and stored in memory and move a memory range. Compucolor Corporation, 225 Technology Park, Atlanta, Norcross, GA 30092.

CIRCLE 305 ON READER SERVICE CARD

Matric, an array handling package for PET/CBM computers is a 5K assembler language program that expands Commodore Basic with fourteen new statements, all of which can be used in Basic programs and entered interactively as direct commands from the keyboard. Versions are available on tape or disk for 8, 16 and 32K machines. $125. Cognitive Products, P.O. Box 2592, Chapel Hill, NC 27514.

CIRCLE 306 ON READER SERVICE CARD

GE Enterprises announces three **Sort Routines** for PET, TRS-80 and other small computers. SCN is used for nu-

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CIRCLE 141 ON READER SERVICE CARD

INTRODUCTION TO PL/I AND STRUCTURED PROGRAMMING

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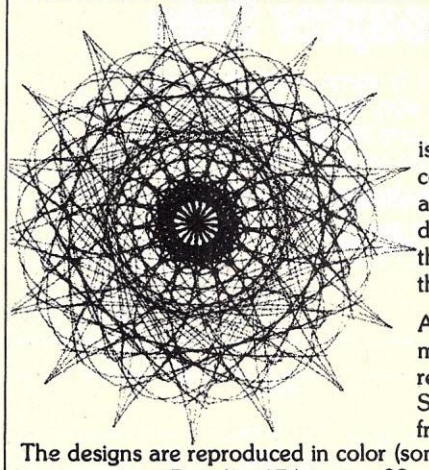
The interesting problems include mathmatical, simulation (maze, Gip bugs),graph-plotting, art, games (scrab-l-word, snakes and ladders, lots, etc),palindromes, cyphers, text analysis and more.

Outline of the PL/I features covered: fixed-point, floating-point, iterative DO statements including WHILE, conditionals, free-format (LIST) and EDIT-directed I/O, declarations, arrays (fixed and variable bounds), procedures and functions, built-in functions, computational error detection and correction, ON-units.



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by Julius Guest

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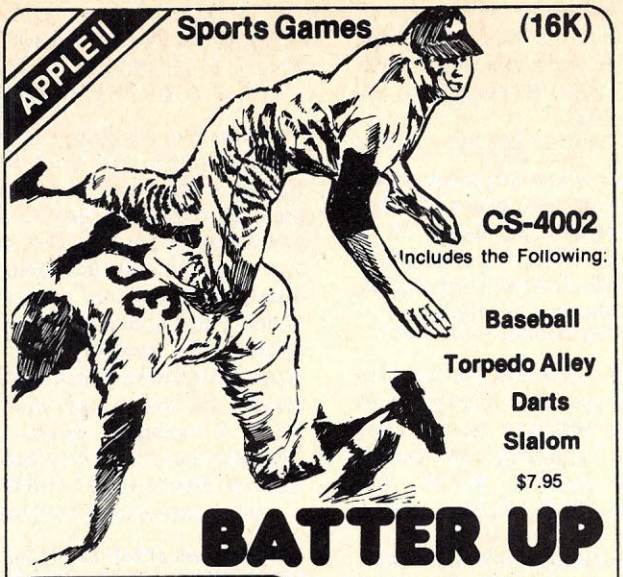
CIRCLE 192 ON READER SERVICE CARD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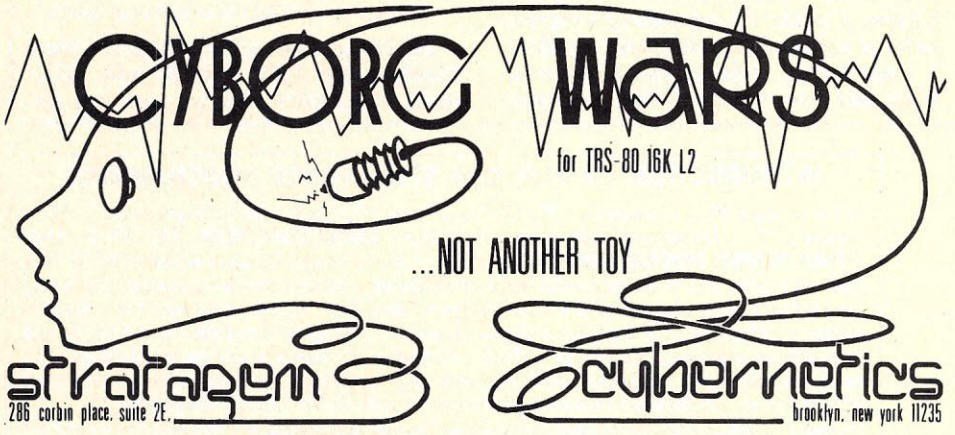

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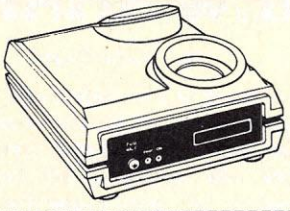

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CIRCLE 191 ON READER SERVICE CARD

meric classes, dates, etc.; SCA for alphanumeric initials and groups; and SCMC for multiple character sorts. $4.95 each or three for $7.95. GE Enterprises, 1417 11th St., Manhattan Beach, CA 90266.

CIRCLE 307 ON READER SERVICE CARD

Control of the running and listing of Apple II programs is now available through the **Video/Print/List Controller** by Howardsoft. The controls are activated by keyboard commands, providing control of running and listing speed, listing format, line printer action and cursor movement. The machine language software is compatible with both Apple II and Apple II Plus computers and will work with Integer Basic, Applesoft and Assembly languages as well as the Apple Monitor. $39 for disk or tape. Howardsoft Software Services, 7722 Hosford Ave., Dept. C, Los Angeles, CA 90045.

CIRCLE 308 ON READER SERVICE CARD

WORD PROCESSING

Quill Driver is a text processor for the TRS-80 Model I or Model II with at least one disk drive. Features include commands for accessing alternate input files, right justification, tabulation and hanging indents, various forms of pagination and a program to allow the transposition of Pencil, Basic and Edtasm test files to any one of the three file types. $39.95. The Alternate Source, 1806 Ada St., Lansing, MI 48910.

CIRCLE 309 ON READER SERVICE CARD

Hanson House has announced the release of **Easy-Word**, a word processor for the TRS-80 Level II. The program, written in Basic, is able by line or word to change, delete, insert and append. $21.95. Hanson House, Dept. 34, 55 Hanson Pl., Stratford, CT 06497.

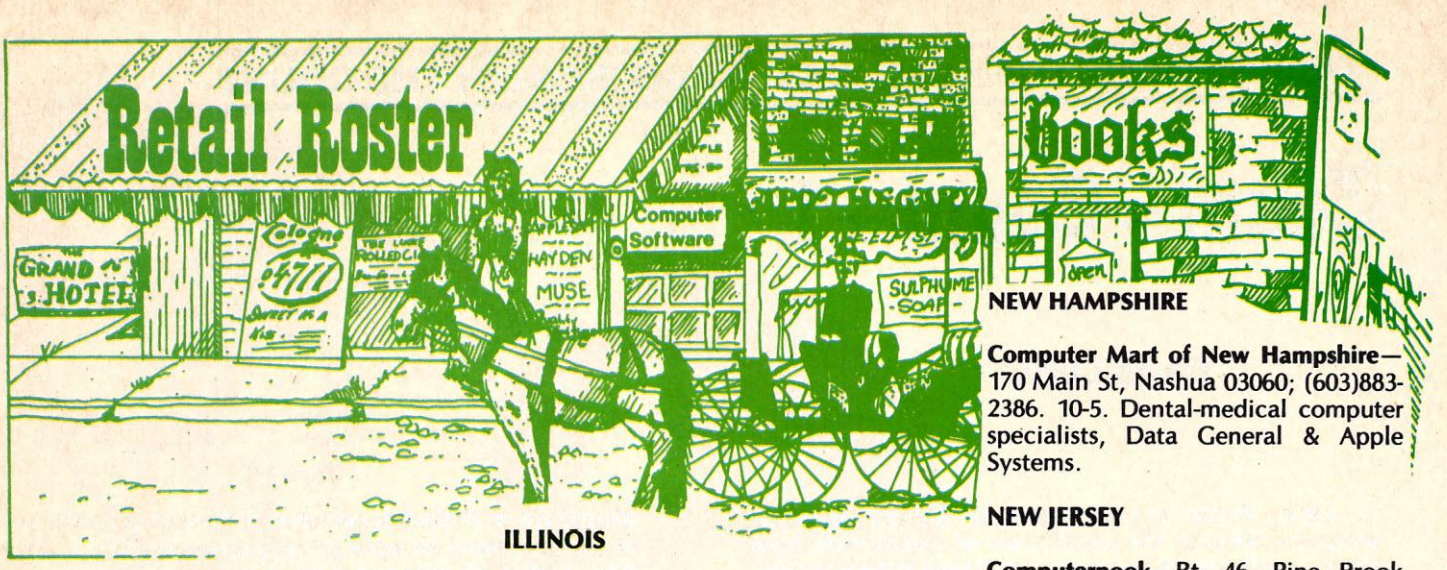
CIRCLE 310 ON READER SERVICE CARD

Stylus is a word processing program for use on 6809 computer systems operating under the Flex operating system. It features cursor based editing with on-screen formatting. Versions are available for most terminals and printers. $150. Sonex Systems, Box 238, Williamsville, NY 14221.

CIRCLE 311 ON READER SERVICE CARD

Magic Window for the Apple is a word processing program that provides for 80-column, upper- and lower-case display and printout without computer modification. It allows the user to do computer-assisted text editing and correction, rearrange copy with simple commands and exercise global search operations. Artsci Inc., 10432 Burbank Blvd., North Hollywood, CA 91601. (213) 985-2922.

CIRCLE 312 ON READER SERVICE CARD



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ComputerLand of Louisville—10414 Shelbyville Rd, Louisville 40223; (502) 245-8288. 10-5:30.

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The Computer Corner Inc—200 Hamilton Ave, White Plains 10601; (914)-WHY DATA. 10-6 Mon-Sat, 10-9 Thu.

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The Basic Computer Shop—2671 W. Market St, Akron 44313; (216)867-0808. 10-6 Mon-Sat.

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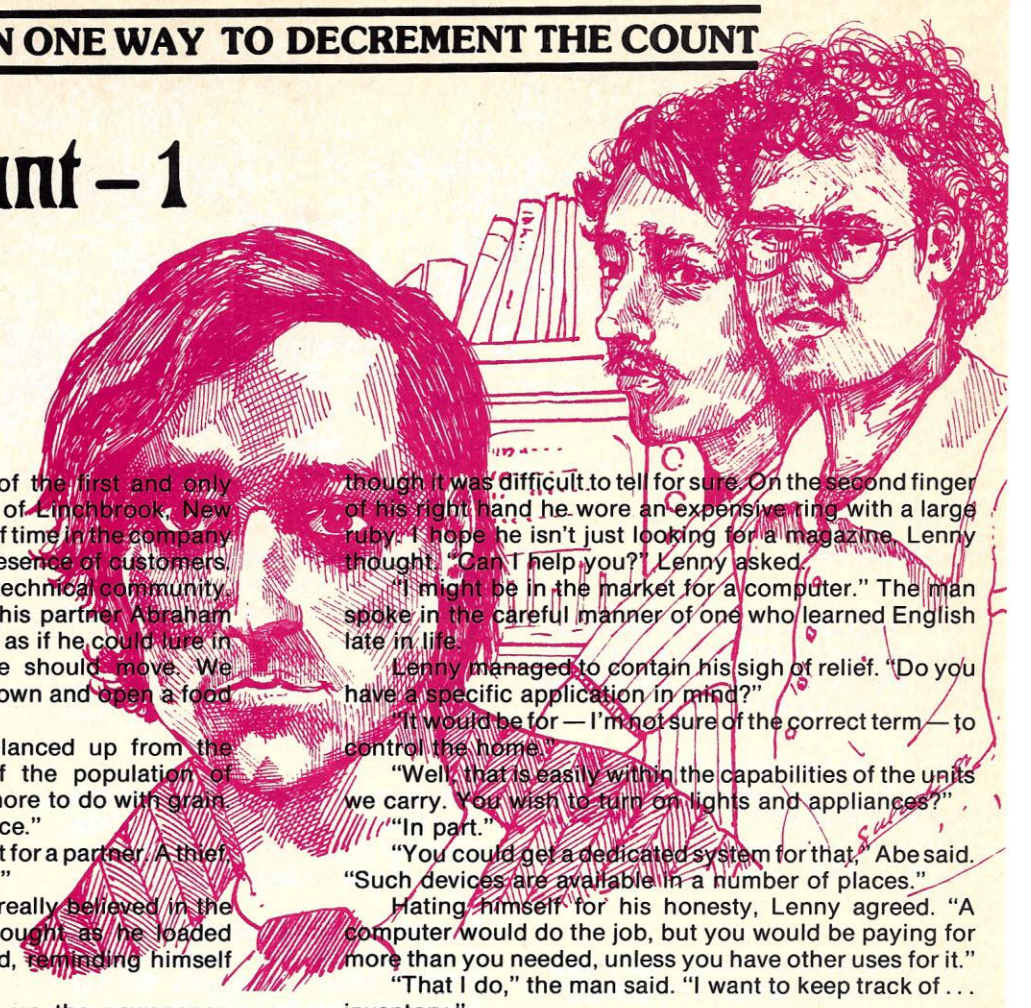
David Lubar



Lenny Potter was half-owner of the first and only computer shop in the small town of Linchbrook, New Jersey, which meant he spent a lot of time in the company of Klingons, and little time in the presence of customers. Linchbrook just didn't boast a large technical community.

"Mistake, this was a mistake," his partner Abraham Roth moaned, peering out the door as if he could lure in customers through telepathy. "We should move. We should relocate. We should close down and open a food and grain store."

"Take it easy, Abe." Lenny glanced up from the terminal. Having just starved half the population of Sumeria, he didn't want anything more to do with grain. "Things will pick up. Give it a chance."

"An optimist. I've got an optimist for a partner. A thief, I could handle. But an optimist, no."

"It'll pick up. It has to." Lenny really believed in the shop. It's a matter of time, he thought as he loaded another game. Little time, he added, reminding himself that the rent was due.

"And this," Abe said, holding up the newspaper. "Crime in the streets. It's not safe anywhere."

Lenny glanced at the headlines. There had been a rash of muggings recently, and none of the victims had been able to identify the criminal. "We can't worry about that."

"The terminology is interesting," the man said after Lenny was done. "Bits, bytes, nibbles — quite interesting."

"You never worry about anything. As long as you can play those games, you're happy."

"Guilty," Lenny said. He was crazy, obsessed, and fanatic when it came to computers. He'd left a decent career in advertising to open the shop. Abe, who had been in the field for years, until he had been forced to retire, showed a bit more restraint. The shop, named "The Quick Byte," drew a fair number of customers, but most left when they discovered the place wasn't a diner.

Looking toward the dark street, Lenny asked, "Shall we call it a night?"

"And disappoint the flood of customers?" Abe shrugged. "Maybe you're right. Maybe business will pick up. But I'm not holding my breath."

As if on cue, a man walked in. "Are you open?" he asked.

"Is uranium heavy?" Lenny crossed the room, taking a good look at the man. He was well dressed in a dark suit of European cut, and appeared to be in his mid-sixties, though it was difficult to tell for sure. On the second finger of his right hand he wore an expensive ring with a large ruby. I hope he isn't just looking for a magazine, Lenny thought. "Can I help you?" Lenny asked.

"I might be in the market for a computer." The man spoke in the careful manner of one who learned English late in life.

Lenny managed to contain his sigh of relief. "Do you have a specific application in mind?"

"It would be for — I'm not sure of the correct term — to control the home."

"Well, that is easily within the capabilities of the units we carry. You wish to turn on lights and appliances?"

"In part."

"You could get a dedicated system for that," Abe said. "Such devices are available in a number of places."

Hating himself for his honesty, Lenny agreed. "A computer would do the job, but you would be paying for more than you needed, unless you have other uses for it."

"That I do," the man said. "I want to keep track of . . . inventory."

"Then you've come to the right place. Let me show you some of the brands we carry." Lenny demonstrated a number of computers, focusing on the ones which were best suited for home control.

"The terminology is interesting," the man said after Lenny was done. "Bits, bytes, nibbles — quite interesting." He selected a rather sophisticated system consisting of a 48K da Vinci computer with dual disks. "I will return tomorrow to pay for my purchase and pick it up. Are you open late?"

"Well . . ." Lenny hesitated. Except for Wednesdays, they closed at five. But he didn't want to lose this sale. "How late?"

The man seemed to be thinking about something. Finally, he said, "After eight."

"We're open till nine."

"Fine."

"We'll see you tomorrow, then, Mr. . . ." Lenny realized he didn't know the man's name.

"Vladimir," the man said, smiling slightly.

He should see a dentist, Lenny thought, noticing the long sharp canines that protruded from the man's blood-red gums. "Thanks for doing business with us."

"My pleasure." He turned toward the door, hesitated, then glanced over his shoulder and said, "This should be a great help to me. I am getting old. At times, I forget important things, crucial things. But this should help. Good evening, gentlemen."

Lenny waited until the man was out of sight, then screamed, "YAHOO!" while jumping up and down. After reentry from orbit, he noticed that Abe wasn't particularly excited. "Come on, Abe, rejoice. We made a sale."

"I don't like it," Abe said.

David Lubar, 249 Loring Ave., Apt. 3, Edison, NJ 08817.

"What do you mean?"

"A man named Vladimir, a man who wants to do business after dark — what does that suggest to you?"

Lenny shrugged. It didn't mean anything to him.

"And those teeth. Add it up."

"It's late. Let's call it a day."

The next morning, Lenny kept his distance from Abe. "What have you been eating?" he asked.

"Garlic."

"For breakfast?"

"It's good for the heart, and the blood."

"Maybe you should let me deal with the customers today," Lenny suggested. With a radius of five feet, Abe was unapproachable.

Vladimir, who came that evening, seemed to share Lenny's opinion. He stayed away from Abe, dealing only with Lenny. After he had paid, in cash, for his purchase, he asked, "Will you be able to help me set up the controls?"

"Sure. When?"

"Tomorrow night?"

"My pleasure. Can I help you carry that?" Lenny didn't want to see the man struggle with the boxes.

"I can manage." Vladimir put one carton under each arm and left the store.

"Strong guy," Lenny said.

"Don't go there," Abe told him. "Stay away from his house."

"What?" Lenny wondered if an overdose of garlic could cause brain damage.

"Don't you know who he is? Haven't you ever heard of Vlad the Impaler?"

"Sure, that's the guy who the Dracula legend was based on." The thought settled uncomfortably somewhere in the region of Lenny's stomach. Letting out a hollow laugh, he said, "Come on, that's ridiculous."

Abe didn't agree. "If you must go, take a cross."

Lenny knew he would feel silly taking a cross with him. But when he left the shop the next evening, he did bring one extra item, one piece of powerful protection that, according to some people, might even be magic.

"Welcome." Vladimir greeted him at the door. "Come into my home."

Gothic, Lenny thought as he entered the ancient house. He felt as if he had stepped onto the set for some grade-B movie.

"As I said, I forget things at time. The shutters must be closed before sunrise, and the basement must be locked during the day. I have mechanisms attached to them. Can the computer manage the control?"

"No problem." Lenny made the connections, then tested them out. Then he asked, "You also said you needed a data-management system?"

"Yes, I have to keep track of . . . donations. It would not do to call on any individual too often."

"Here, this should do the trick." He handed Vladimir a disk. "Just load it and it will tell you what to do. It's very user-oriented. You can set up any fields you want." He paused. Vladimir was staring at him. Lenny felt strange, suddenly weak. His will was gone and he was falling into a vortex created by those bloodshot eyes.

Vladimir stepped closer. His mouth gaped open, becoming a cave rimmed with razor-sharp stalactites. His breath carried the dried must of a grave.

Drawing on what little strength remained, Lenny managed to say, "These things can have problems at first."

"What do you mean?"

"It takes a while to set up any new system and get out all the bugs. Remember, you can call on me if you need any help. We like to be valuable to our customers, very valuable. If I may boast, I think our support can be crucial."

"Yes, I see." Vladimir lowered his eyes.

Lenny staggered, almost as if he had been released from a powerful grip. "One more thing," he said, reaching into the small briefcase he carried. He put his fingers on the item, pulling it out slowly, almost reverently. He held it up, trying to control the quivering in his hands. "A little gift."

"Thank you." Vladimir took it from him.

"Call if you have a problem," Lenny said, backing away. The doorknob finally met his hand. Calmly, he stepped to the porch, closing the door behind himself. Then he ran.

"You're still alive," Abe said the next day. He moved closer to Lenny, staring at his neck.

"No wounds," Lenny said, "but it was close."

"Then you believe me?"

"I'm not sure."

"We have to do something about him."

"I already did."

"You mean — " Abe held out an imaginary stake and made a hammering motion with the other hand.

"No, nothing like that." Lenny knew he couldn't do something like that. "I took a safer route. If we're wrong, there's been no harm."

"And if we're right?"

"I'll show you. Let's pay Vladimir a visit."

They went to the edge of town, where the house was. He'll be home, Lenny thought. *He's an old, eccentric person, and nothing more.* There was no answer to his knock. Lenny tried the knob. It turned under his hand. "Come on."

"It takes a while to set up any new system and get out all the bugs. If I may boast, I think our support can be crucial."

"I don't know if we should."

"It's daytime," Lenny said. "We're safe." He opened the door the rest of the way, feeling slightly disappointed that it didn't emit a rusty creaking sound.

They stepped inside. Sunlight filtered through the shutters, lighting dancing particles of dust. A small red light, like an animals eye, glowed from the next room.

"He left one of his disks on," Abe said.

It worked, Lenny thought. He walked into the room. The terminal was also on, displaying a page of text.

Abe glanced at the screen, then said, "Adventure?"

"Yup, I gave him a disk. Thought it might interest him. You know how hard it is to stop once you get started. And it used the whole system, overriding the controls on the shutters. So if he really was — "

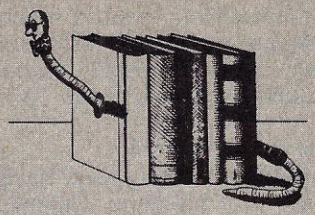
Abe grabbed Lenny's arm and pointed to the chair. Lenny looked down, and felt a shock that was tinged with just a bit of sadness and regret. The chair was covered with ashes. Lying in the ashes was a ring, a ring set with a large, red ruby.

I am getting old. At times I forget important things, crucial things. The man's words came back to Lenny. "Let's get out of here." As they left the room, he glanced back at the computer.

"Leave it be," Abe said.

"All right. But he was so close to the end." Drawing again on his will power, Lenny forced himself to walk away from the unfinished game. □

Reviews



Steve Gray, et al

6502 Assembly Language Programming, by Lance A. Leventhal. Osborne/McGraw-Hill, Berkeley, CA. 632 pages, paperback $12.50. 1979.

After writing books on assembly-language programming with the 8080A/8085, 6800 and Z80, Leventhal has generated another thick book, packed with all you'll ever want to know about the 6502 microprocessor.

This book is, of course, of interest almost entirely to people writing assembler programs for 6502-based computers such as the Apple-II, or for 6502-based developmental systems, and thus may not have as wide an audience as Dr. Leventhal's three previous books on assembly-language programming.

As usual, the emphasis is on "presenting a large number of fully debugged, practical programming examples," as the back cover puts it.

Features of the book include over 80 programming examples, input/output devices and interfacing methods, and how to program the 6502 interrupt system.

Some of the 15 chapters are on the 6502 instruction set (112 pages), simple programs, simple loops, character-coded data, code conversion, arithmetic problems, tables and lists, subroutines, input/output (129 pages), interrupts, problems definition and program design, debugging and testing, documentation and redesign, and two sample projects.

As usual with Leventhal books, this one is crammed with facts and data, well-written, and meant for the hard-core assemblernik.

FORTRAN 77 For Humans, by Rex Page & Rich Didday. West Publishing Co., 50 West Kellogg Blvd., St. Paul, MN 55165. 486 pages, paperback $13.95. 1980.

The authors felt there was a need "for a book that provides coordinated introduction to both the rules of Fortran and the creative process of designing algorithms."

The book is patterned after their "Fortran for Humans," and reportedly "provides an alternative for those who have access to a Fortran 77 compiler or any Fortran compiler which supports the CHARACTER data type and list-directed I/O (the WATFIV compiler, for example)."

Each feature of the language is presented with a flowchart and a "plan" that is a words-only version of the flowchart. A great deal of time has been taken to make the text as easy-going as possible, and most of this textbook can be understood by a bright high school student.

Review exercises are included with each section of each chapter, with answers at the back of the book. In an effort to enliven the text, the authors have included some humorous problems, such as writing a program for helping select the winner in the 324th Annual Pumpkin Growing Contest of the Future Farmers of Grand Fenwich; the weight of the pumpkins is measured in tsernotecs.

Cartoons are also used to illustrate features such as compile-time errors, and to enliven some of the problems. Very few are funny, and all are wretchedly drawn.

But this is one of the few drawbacks in an otherwise fairly well written textbook that some teachers may find amusing enough to recommend.

PET and the IEEE 488 Bus (GPIB), by Eugene Fisher and C.W. Jensen. Osborne/McGraw-Hill, Berkeley, CA. 250 pages, paperback $15.00. 1980.

A book with a title as cryptic as this is obviously not going to be a best seller, but among instrument designers, programmers and computer hobbyists who want to use the PET computer as an intelligent controller of instruments, this should be a real winner. For one thing, it's the only book available, at this writing, that presents a "how-to-do-it" description of the PET-IEEE interface.

The IEEE Std 488-1978 is said, on page 5, to be generally referred to as the GPIB, which stands for General Purpose Interface Bus.

Features of the book include the bus structure (with all control lines and data-bus lines described), the handshake procedure, sample bus transactions, timing diagrams for PET Basic statements that communicate with the bus, how to interface with non-standard bus devices, how to use a logic analyzer for troubleshooting, test programs for use as diagnostic aids, and a nine-page list of IEEE 488-bus-compatible products (including calculators, computers, instruments, and peripherals).

A great many timing diagrams, photographs, drawings, and humorous explanatory cartoons go a long way toward making this fairly complex subject as understandable as possible.

Ten Easy Pieces: Creative Programming for Fun and Profit, by Hans Sagan & Carl Meyer, Jr. Hayden Book Co., Rochelle Park, NJ. 190 pages, paperback $7.95. 1980.

"Here's an introduction to Basic language simulations through computer games," says the back cover of this interesting and worthwhile book.

After a couple of introductory chapters, the authors get into graphics (the hard way, with many DATA lines), RND (random walk), INT (gambling game), LEN (Hangman), math functions (spacecraft landing), and end with a card game and approximating pi. (Many other statements are covered in addition to those cited.)

A dozen or so excellent programming projects are included with each chapter; no answers are given.

The authors, both professors of mathematics at North Carolina State University, provide a fascinating and easily understood introduction to writing games. Some fairly technical information is given very clearly, such as on some complicated nested loops, probability, landing a spacecraft, etc. Two appendices provide details on Archimedes' formula for approximating pi, and on a pseudo-random number generator.

All in all, a nicely written book, of interest to anybody who wants to write games, or who wants to know more about the subtleties of advanced programming in Basic.

The title refers to the authors' belief that "when you run a program, which you have just written, for the first time on the computer, and it actually works, the feeling of exhilaration is the same as it must be when a composer hears his composition performed for the first time and the audience does not belt him with eggs, tomatoes, and other objects with a high rotting potential . . . In this musical vein, we have divided our book into sections called 'Movements' and have even provided a Prelude and Postlude." (The Prelude is the introduction, the Postlude is the number generator.)

Computers and Social Controversy, by Tom Logsdon. Computer Science Press, 9125 Fall River Lane, Potomac, MD 20854. 410 pages, hardcover $15.95. 1980.

The author has assembled a baker's dozen of chapters from

a wide variety of sources, added a few obvious comments and produced a book that looks mighty impressive.

The 13 chapters are An Introduction to Computer Technology, The Von Neumann Legacy (binary arithmetic, languages, computer functions), The Care and Feeding of a Digital Computer (cards, tapes, printers, CRTs), The Computer's Memory, Software Engineering, Electronic Privacy Intrusion, Computer Fraud, Machines That Teach, The Era of Intelligent Machines, Computers and Automation, The Scanner Revolution, Computers and Our Monetary System, and The Future.

The book's advantage is that it puts together a great deal of interesting reference material that would take a long time for the average reader to locate in individual bits and pieces.

The book covers such things as "Shaky," the goal-directed robot at Stanford Research Institute, UPC bar-code scanners, the relationship of computers to military power, and on, and on.

However, what Logsdon has written to knit together these many bits and pieces is painfully platitudinous, with many sentences such as "Today . . . our military establishment is almost completely dependent upon the high-speed digital computer" and "the American educational system is big business."

If you're interested in the social implications of computers, you might buy this book for its large quantity of reference material. If you're interested in finding something to help you go to sleep, you might buy this book for the soporific effect of its writing.

TRS-80 Disk And Other Mysteries, by Harvard C. Pennington, IJG Inc., 569 North Mountain Ave., Upland, CA 91786. 133 pages, paperback $22.50. 1979.

For TRS-80 disk users who've been trying to figure out what's going on inside the software, $22.50 is a small price to pay to keep from going crazy.

In his introduction, Pennington says, "No doubt you have been told that you cannot do certain things with the TRS-80 — like BOOT a Basic program because you need Basic to load a program — or that you cannot lock out the break key without messing up the I/O routines — or that you cannot defeat the LIST and LLIST commands. You have been told wrong. All of these things can be done!"

In the next paragraph he says, "This couldn't have been done without an incredible program called SUPERZAP," a product of Apparat Inc., of Denver.

After saluting the Tandy Corp. "for the development, production and distribution of this magic machine," Pennington gives them a blast because "The general quality of follow-on support, development and software was abysmal. Information about the workings of the system was (and is) a carefully and jealously guarded secret."

The book discusses how disks are organized, how space is allocated, how files are located on disk, and "the tools that one may use to look at disk files and directories . . . it also gives clear information how to FIX disk problems such as lost files, Electric Pencil bugs and other snafus."

After a chapter on Reading & Using SUPERZAP 2.0, the book gets into Other Utilities, Operating Systems, Disk Organization, The Directory, Passwords & Other Trivia, Data Recovery, Files, Recovering Electric Pencil Errors, Correcting the GAT and HIT Sectors, and Some Things You Can Do (making Electric Pencil files in Basic, adding commands to SUPERZAP, converting data in ASCII files, etc.).

Appendix A provides a glossary, Level II Basic tokens, and hex dumps of TRSDOS 2.2, NEW DOS 2.1 and VTOS 3.0 directories. Appendix B covers disk-drive maintenance, suggested reading, "Murphy's Law and Other Corollaries," how to order NEW DOS and SUPERZAP, and ends with SEARCH, a Basic program that will search a disk file for any byte combination up to 255 bytes.

All in all, a most welcome book, despite the price. The author has dug deep and gives information you probably won't find anywhere else.

If Pennington gets tired of writing, he might make a living at cartooning. All the illustrations in this book are his, and he is one of the very few fine cartoonists who really understand computers, a rare type.

The book's subtitle is TRS-80 Information Series Volume I. Although this book is a hard act to follow, let's all hope for another winner like this one.

Learn Micro-Computers, by Nat Wadsworth. Scelbi Publications, Box 133 PP STN, Milford, CT 06460. 328 pages, paperback (plus cassette tape), $14.95. 1978.

This is a fairly successful attempt to explain computers to the uninitiated, along with a tape that includes a chapter-by-chapter synopsis of the book, review questions, and references to page numbers for further review, in case you didn't know the answers.

The book's six chapters cover basic operation of a small computer, instructions for small computers, machine-language programming, higher-level-language programming, input/output devices, and system considerations. The appendix is a unique combination of glossary and index.

Although "the purpose of this book is to take the mystery out of the operation and practical application of small computers," as the introduction puts it, the programming portions get much more heavily into machine language than some readers may care for. However, they can skip over those parts, which may well be of interest to those who really want to know what it's all about.

Although the writing is sometimes rather stilted, the author more than makes up for it with an earnest desire to explain exactly how everything works, in as simple language as he can, in this book whose title is "Understanding Microcomputers and Small Computer Systems."

Philosophy for Investors by Jason Alexander, Sitnalta Press, 1881 Sutter St., San Francisco, CA 94115. 75 pages, paperback $9.95. 1979.

Many individuals are using their personal computers for investment analysis. However, before leaping into this application it is important for an individual to have consistent investment philosophy and goals. This book is a collection of 12 essays which originally appeared in 1979 in an institutional investment advisory service newsletter.

The content is weighted much more heavily toward philosophy than investment. Indeed, stocks, bonds, price/earnings ratios and other common investment terms are never mentioned. Instead, Mr. Alexander focuses on "Metaphysics — What is; Epistemology — How do we know it; Ethics — So what; Politics — What then; Aesthetics — And?" The layman might sensibly ask, what has all that got to do with me? It is the purpose of the book to answer just that question. Does it?

Yes and no. If you've read Ayn Rand this is a refreshing little review. If you haven't, then this is an insightful start on a consistent philosophy of life. Why the book is called *Philosophy for Investors* escapes me. It's much broader than that. Perhaps it's because investors are used to paying $10 for a 75-page typewritten book. But that's cynical, which I should not be toward this little volume. On the other hand, I'd feel better recommending this book if it cost $2 or $3 since you can get fundamentally the same philosophy in a more comprehensive way from any of Any Rand's novels. But as a condensation, this is the best I've seen. — *DHA*

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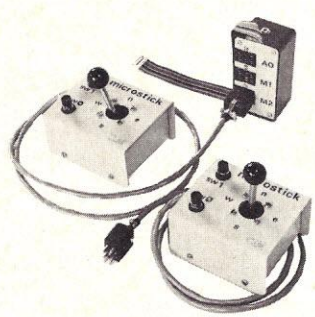

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Personal Computing: Home, Professional, and Small Business Applications, by Daniel R. McGlynn. John Wiley & Sons, New York. 273 pages, paperback $9.95. 1979.

This handsome and well produced book is only a trifle better than the mass-market paperbacks that have been cobbled together by people who know little or nothing about computers.

These 273 pages contain a great dealof material of little or no interest to the reader interested in the basics of personal computers. Dozens of space-filling tables and illustrations are included, such as photos of the "Tektronix 8000" development system, two pages of Sol Basic commands, three pages of APL/Z80 character set and functions, a page on the EBCDIC character set, two pages on the 5x7 dot-matrix character set, and 71 pages of appendices such as a list of "S-100 bus board manufacturers," a list of turnkey systems, and badly out-of-date lists of computer stores and clubs.

The chapter on basic application programs is only three pages long, yet the chapter on interfacing takes up 12 pages with the S-100 bus, complete with six pages of pin definitions and timing diagrams.

The first chapter is liable to turn off a prospective reader. around page 10, the start of a four-page "technical comparison of computers," or page 16, with a section on "benchmarking the 6800, 8080 and Z-80." Both are marvelous examples of too much, too soon.

A determined reader who can wade through all the superfluous material, may find several dozen pages of interest, but they are few and far between in this jumble.

Machines Who Think, by Pamela McCorduck, W. H. Freeman & Company. 375 pages, $14.95. 1979.

With one humanist foot planted firmly on scientific soil and one scientifically curious foot planted firmly in the soil of the humanities, Pamela McCorduck has written a book that stands astride the wildly diverse histories of the ultimate in computering and the ultimate in human understanding *of* understanding: artificial intelligence.

Here is a thorough intellectual grasp of what's going on in AI, not for the solder-gunners or the bug hunters, but for the humans to whom it will mean the greatest wrench: the ones who haven't yet heard of it. To deliver the message, McCorduck has called upon the timing and insight of the dramatist. We have here an exciting plot, no less. "To know intelligence well enough to be able to build a working model of it," she writes, "is surely one of the most intellectually exciting and spiritually challenging problems of the human race."

McCorduck delivers on that promise of adventure with a tale elegantly crafted, the more exciting because it is fact, the more suspenseful because there is not yet a neatly tied ending. Put quite simply, this "Personal Inquiry into the History and Prospects of Artificial Intelligence" is a captivation that makes it for us, as readers, our own adventuresome inquiry.

So we stand beside Herbert Simon at a moment of revelation in RAND's Santa Monica air-defense lab, "when I first began to sense that one could look at a computer as a device for processing information, not just numbers." With Allen Newell, we are struck to see Oliver Selfridge and G. P. Dinneen's pattern recognizer exhibiting learning behavior, and there is a sense of *now:* "I had such a sense of clarity that this was a new path," recalls Newell, ". . . that we'd entered a new world as far as our ability to conceptualize."

And we are there at Carnegie Tech in 1956 with Edward Feigenbaum and other students when Simon walks into a classroom saying "Over Christmas Allen Newell and I invented a thinking machine." And then on the Dartmouth campus when a diverse bunch of scholars assemble, some not yet sure that

what they're up to is in fact "scholarly," but drawn together by mutual conviction that machine thought ought to be possible. The players in this drama range from Karel Kapek's robot and Mary Shelley's Dr. Frankenstein through Ada Lovelace and Charles Babbage to Norbert Weiner and John von Neumann, to John McCarthy and Marvin Minsky and Raj Reddy and Terry Winograd, and a cast of hundreds still growing. We even pause in the rush of exploration to hear of the discomforts of a Hubert Dreyfus and the moral misgivings of a Joe Weizenbaum.

But it's more than an adventure. McCorduck's book is a catalog of what we all know must be going on out there somewhere, not just assembled between covers but interconnected like a nervous system trying to command a sense of a coordinated activity. With the only notable lapse a slighting of the adaptive-systems realmof AI (though it is there, somewhat disguised), McCorduck has produced a work that will long serve as the text for those who would inquire into the whybother of AI, and as a lodestone drawing young minds into the inquiries that will constitute the future of the field.

The book's magnetism is McCorduck's facility with language and structure: a storytelling tradition that seduces us into a love affair with a most important story. Though fact, it is as commanding as all fiction: the quest for knowledge, and the quest for self. *Dick Lutz*

Dr. Dobb's Journal of Computer Calisthenics and Orthodontia, People's Computer Company Series, Hayden Book Company, 50 Essex Street, Rochelle Park, NJ 07662. Vol. 1 (1976), 368 pages. Vol. 2 (1977), 480 pages. Vol. 3 (1978), 480 pages. $18.95 each.

Dr. Dobb's Journal was originally published in 1976, when People's Computer Company was organizing the backing of the development of Tiny Basic. Their original plan was to do only a few quick issues to document and distribute Tiny Basic, but PCC soon discovered they had a ready-made readership of bit-hackers in search of a forum, a niche which Dr. Dobb's Journal easily filled. These three books contain absolutely everything that appeared in DDJ 1976-78, even the covers.

There's more creativity, wild ideas, and raw enthusiasm here per page than you are likely to find anywhere else in the personal computing press. And how it takes you back to the "old days" of personal computing: tiny languages of unconventional design, computer music on AM radios, debates on software piracy and copyrighting, diddly little machine language video games for the VDM-1, bug fixes for front panels, disassemblers and macroprocessors, TV Dazzler routines, and more. We witness the rise and fall of computer manufacturers like MITS, IMSAI, TDL, Processor Tech, Polymorphic, and see the increasing influence of products like the Apple II and CP/M. Curiously enough, DDJ editors and readers tended to support manufacturers who went out of business (mainly because of catering only to hobbyists) and to ignore developments like the Apple II and TRS-80 as long as possible.

Purely as a nostalgic trip, computer hackers from way back will enjoy browsing through one of these books for an hour or two. But as a helpful reference, most of this stuff is obsolete. No one much needs a Tiny Basic interpreter or a machine language game to toggle in from the front panel. Although some of the articles might prove useful as sources of theory for writing your own programs, this kind of material is better found elsewhere.

It's a little sad to see how personal computing is growing up, with so much exploitation, promising so much and delivering so little sometimes, but it was probably inevitable, and a lot has happened in the last few years which can't be ignored. These books are fun to read as historical references, but their value outside of that is limited. *—SN*

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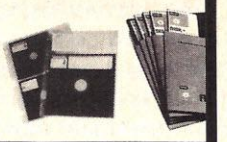

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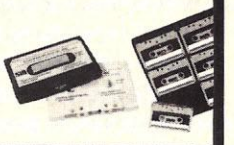

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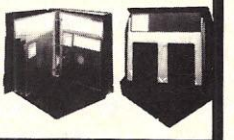

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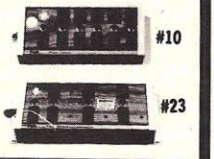

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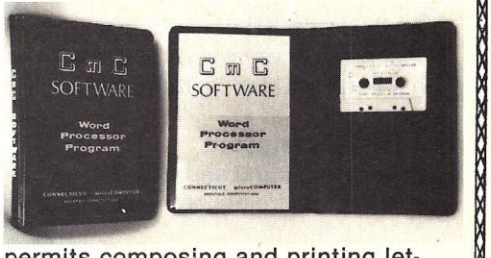

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A thirty page instruction manual is included.

The CmC Word Processor Program for the 8K PET is $29.50. The 16/32K version is $39.50.

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THE MIGRATION OF DARKNESS

Each evening, shortly after sunset,
darkness covers the land.
    Having mystified thinkers for millenia,
    the mechanism for this occurrence
    has now been identified: migration.
Darkness, it has been found, is composed
of an almost infinite number of particles,
which roost and reproduce up north
where they have fewer natural enemies:
    Forest fires, lampposts, lasers, blazing sunlight,
    torches, candles, lighthouses, limelight, and electricity
    are relatively rare in the polar regions.
These lightweight bits of darkness
flock together and fly south each evening
to more fertile land in a never ending search
for an abundant food supply.
With the coming of the rising sun,
they return to their northern nesting grounds.
However, not all specks of darkness migrate.
Some that are less adventurous
    or downright lazy
choose to stay behind.
These covey together, in varying numbers,
seeking shelter from the strong sunlight
    by gathering under leafy trees, behind
    large rocks, and underneath umbrellas;
    Hiding in alleys, between parked cars,
    in caves, and inside empty pockets.
These clusters are perceived by us as shadows.
They have a somewhat shorter lifespan
than those which migrate.

RAINBOW BRIDGES

An environmentally enlightened engineer decides
that all riverways, canyons, crevices and valleys
are to be bridged by rainbows.

A rainbow bridge
is a more natural and esthetic way
to connect two separate land masses.

This evanescent design was chosen
because of its imperviousness
to wind, storm, and flying creatures.

The lightweight and immaterial bridges
will be planned to hold seven lanes of traffic:
Red, orange, and yellow will be restricted
to high speed commercial vehicles.
Green, blue, and violet will be designated
for passenger cars.
While Indigo will be reserved for pedestrians,
bicyclists, and runners.

Handrails and flashing lights will be added
to assure the safety
of those on foot.

It is hoped the faint glow of the roadway itself
will ease drivers' eyestrain.

Until engineers can perfect a practical
nighttime model,
the rainbow bridges will be operational
only on sunny days.

WIDE OPEN SPACES

There are
13 billion
light years
between me
and the edge
of the universe.

And that's
the way I like
it, pardner.

for John Wayne

THE ORIGINS OF THE MATERIAL WORLD

Long before the Earth was formed
it was postulated that the nothingness
    which existed everywhere
    in the universe
could be condensed and compacted
into a state of fluid equilibrium.
In this way it would form the sub-stratum
of the material world.

With the help of a primitive compression chamber,
small bits of nothingness
were first compacted into ideas
    however fleeting.
A person would get an idea
then immediately forget it.
Much head scratching was in evidence.

Sometime later
    though technically
    in an eternal world of nothingness
    time doesn't exist
the first idea was captured and stabilized.

The mechanical device to accomplish this feat
resembled a think tank
    with a vacuum cleaner attached
    to the end of its hose.
One by one these captured ideas
were transferred into a larger chamber.

Then the unanticipated happened.
The trapped ideas began mating with one another,
    and freak of nature that it was
their offspring were genetically mutated.

These biologically altered ideas
were born into the world as material objects:
    planets, trees, books, animals,
    clouds, gothic cathedrals, rocks,
    rainbows, etc.
Things rained down from the sky
in a torrential downpour.
The world of nothingness melted away
like snow in a warm spring rain.

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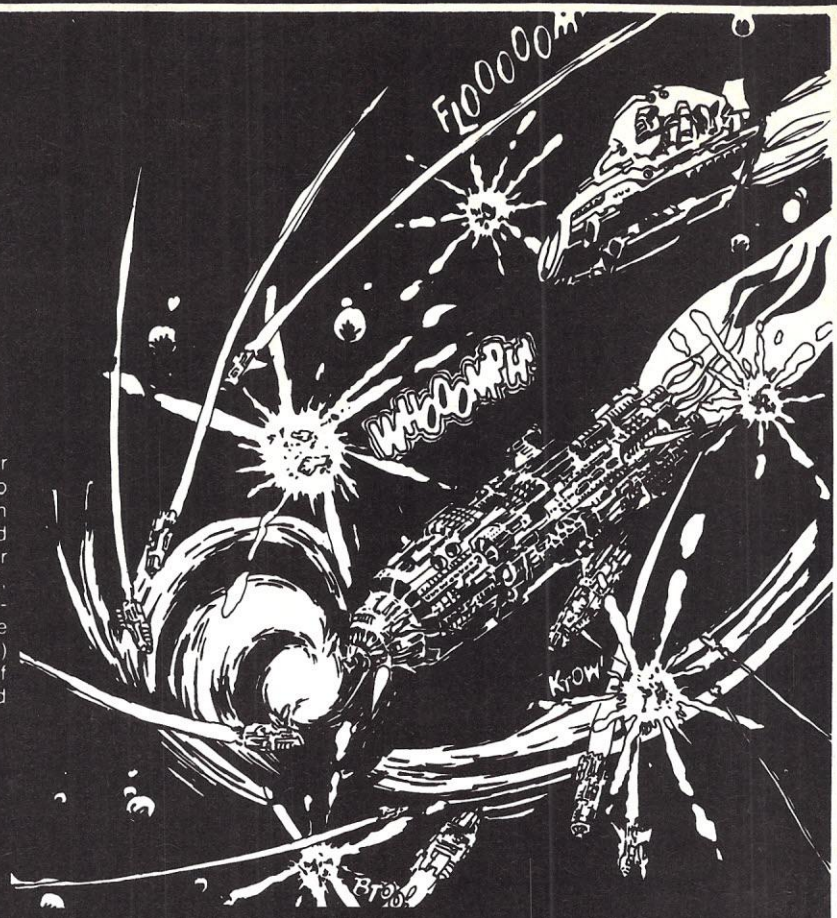
SPACE WAR



You're in command in **SPACE WAR!** Destroy your opponent's ship by forcing him to collide with the sun or to explode upon re-entry from hyperspace. . . or challenge him face to face with missile fire. You're in command of the speed and direction of your ship. You control the timing of your missiles. You select the game mode from five options, including Reverse Gravity, and the battle begins. . . Accelerate to place your shots--and escape into hyperspace before your opponent comes within range. But be wary, he (or she!) may circle out of sight and reappear on the opposite side of the galaxy! (This is the classic MIT game redesigned especially for the Apple.)

and SUPER INVASION

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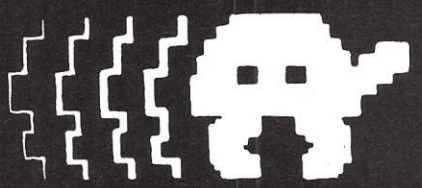

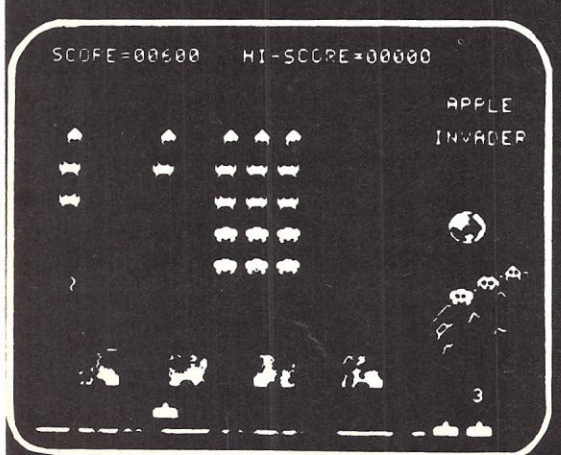

Fifty-five aliens advance and shower you with lethal writhing electric worms. As you pick off the aliens, one-by-one, they quicken their descent. They whiz across the screen wearing away your parapets, your only defense, coming closer and closer to your level. **Super Invasion** is the **original** invasion game with the original moon creatures and faster action than any other invasion game on the market.

Super Invasion is available for only $19.95 on cassette (CS-4006) for a 32K Apple II. **Space War** is $14.95 on cassette (CS-4009) for a 16K Apple II. **Space War** and **Super Invasion** are on one disk (CS-4508) for a 48K Apple II for only $29.95.

Send payment plus $1.00 shipping and handling to Creative Computing Software, P.O. Box 789-M, Morristown, NJ 07960. NJ residents add $1.00 sales tax. Bankcard orders may be called in toll free to 800/631-8112. In NJ call 201/540-0445.

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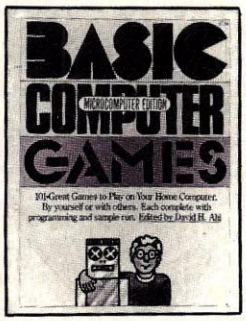
Basic Computer Games

Edited by David Ahl, this book contains 101 imaginative and challenging games for one, two, or more players — Basketball, Craps, Gomoko, Blackjack, Even Wins, Super Star Trek, Bombs Away, Horserace. Simulate lunar landings. Play the stock market. Write poetry. Draw pictures.

All programs are complete with listing in Microsoft Basic, sample run and description. Basic conversion table included. 125,000 copies in print. 192 pages softbound. [6C] $7.50.


BASIC
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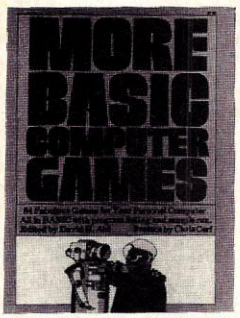
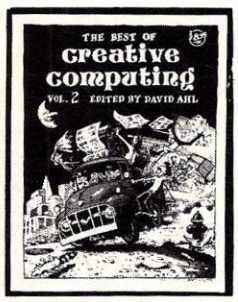
GAMES
MICROCOMPUTER EDITION
101 Great Games to Play on Your Home Computer.
By yourself or with others. Each complete with
programming and sample run. Edited by David H. Ahl



More Basic Computer Games

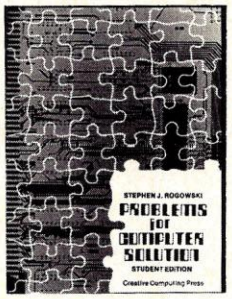
Contains 84 fascinating and entertaining games for solo and group play — evade a man-eating rabbit, crack a safe, tame a wild horse, become a millionaire, race your Ferrari, joust with a knight, trek across the desert on your camel, navigate in deep space.

All games come complete with program listing in Microsoft Basic, sample run and description. 192 pages softbound. [6C2] $7.95.



The Best of Creative Computing

The first two years of **Creative Computing** magazine have been edited into two big blockbuster books. **American Vocational Journal** said of Volume 1, "This book is the 'Whole Earth Catalog' of computers." [6A] Volume 2 continues in the same tradition. "Non-technical in approach, its pages are filled with information, articles, games and activities. Fun layout." —**American Libraries.** [6B] Each volume $8.95.



Problems for Computer Solution

Here are 90 problems with a thorough discussion and references for each. Eleven types of problems are included, for example, arithmetic, algebra, geometry, number theory, probability and science. Even includes three classic unsolved problems and seven appendices. 104 pages softbound, $4.95 [9Z].

The teacher's edition contains solutions with complete listing in Basic, sample run and in-depth analysis explaining the algorithms and theory involved. 280 pp softbound, $9.95 [9Y].

Katie and the Computer

Fred D'Ignazio and Stan Gilliam. This is a delightful story told in words and full color drawings of Katie's adventures when she "falls" into a computer. In Katie's journey through the land of Cybernia she meets the Software Colonel, the Bytes, the Table Manager and even a ferocious Program Bug. Her journey parallels the path of a simple command through he stages of processing in a computer, thus explaining the fundamentals of computer operation to 4-10 year olds. Supplemental explanatory information is contained in the front and back end papers. 42 pp. hardbound $6.95. (12A)

Computer Music Record

A recording was made of the First Philadelphia Music Festival which is now available on a 12" LP record. It features eight different computer music synthesizers programmed to play the music of J.S. Bach, J. Pachelbel, Rimsky-Korsakov, Scott Joplin, Neil Diamond, Lennon & McCartney and seven others. The music ranges from baroque to rock, traditional to rag and even includes an historic 1963 computerized singing demonstration by Bell Labs. $6.00 [CR101].

The Best of Byte

This is a blockbuster of a book containing the majority of material from the first 12 issues of Byte magazine. The 146 pages devoted to hardware are crammed full of how-to articles on everything from TV displays to joysticks to cassette interfaces and computer kits. But hardware without software might as well be a boat anchor, so there are 125 pages of software and applications ranging from on-line debuggers to games to a complete small business accounting system. A section on theory examines the how and why behind the circuits and programs, and "opinion" looks at where this explosive new hobby is heading. 386 pp softbound. $11.95 [6F]

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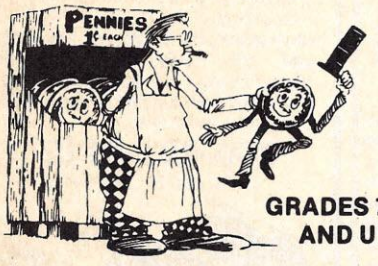
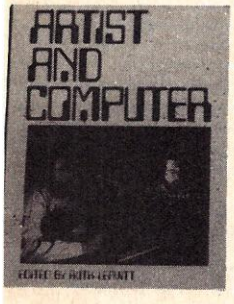


GRADES 7 AND UP

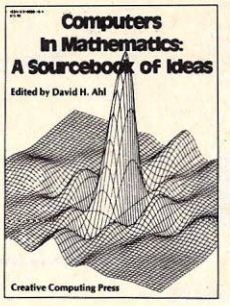
Computer Coin Games

Computer Coin Games by Joe Weisbecker aids newcomers to the field of computers by simplifying the concepts of computer circuitry through games which can be played with a few pennies and full sized playing boards in the book. Enhanced by outrageous cartoons, teachers, students and self-learners of all ages will enjoy this 96 page softbound book. [10R] $3.95.



Artist and Computer

This unique book by Ruth Leavitt covers the latest techniques in computer art, animation and sculpture. In its pages 35 artists explain how they use computers as a new means of self-expression. **The San Francisco Review of Books** said "Get yourself a copy of this book if you enjoy feeding your mind a diet of tantalizing high-impact information." Over 160 illustrations, some in full color. 121 pages hardbound [6E] $10.00. Softbound [6D] $4.95.



Computers in Mathematics: A Sourcebook of Ideas

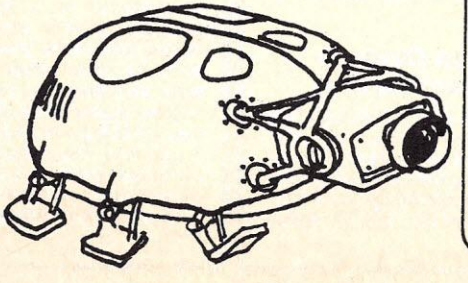
Here is a huge sourcebook of ideas for using computers in mathematics instruction. This large format book contains sections on computer literacy, problem solving techniques, art and graphing, simulations, computer assisted instruction, probability, functions, magic squares and programming styles.

One section presents over 250 problems, puzzles and programming ideas--more than is found in most "collection of problems" books.

Pragmatic, ready-to-use, classroom tested ideas are presented for everything from the most basic introduction to binary numbers to advanced techniques like multiple regression analysis and differential equations. Every item discussed has a complete explanation including flowcharts, programs and sample runs.

The book includes many activities that don't require a computer. And if you're considering expanding your computer facilities you'll find the section on how to select a computer complete with a microcomputer comparison chart invaluable.

Much of the material has appeared in **Creative Computing** but the back issues are no longer available. Hence this is your only source to this practical and valuable material. Edited by David H. Ahl,this mammoth 224-page softbound book costs only $15.95. (The individual issues, if they were available, would cost over $60.00). [12D]



The Impact of Computers on Society and Ethics: A Bibliography

REFERENCE

Gary M. Abshire.

Where is the computer leading us? Is it a menace or a messiah? What are its benefits? What are the risks? What is needed to manage the computer for society's greatest good? Will we become masters or slaves of the evolving computer technology? This bibliography was created to help answer questions like these. It contains 1920 alphabetical entries of books, magazine articles, news items, scholarly papers and other works dealing with the impact of computers on society and ethics. Covers 1948 through 1979. 128 pp hardbound. $17.95. [12E].

Be A Computer Literate

Marion J. Ball & Sylvia Charp

This informative, full color book is an ideal first introduction to the world of computers. Covers kinds of computers, how they work, their applications in society, flowcharts and writing a simple program. Full color drawings, diagrams and photos on every page coupled with large type make this book easy to read and understand. Used as a text in many schools. 66 pp softbound, $3.95 [6H].

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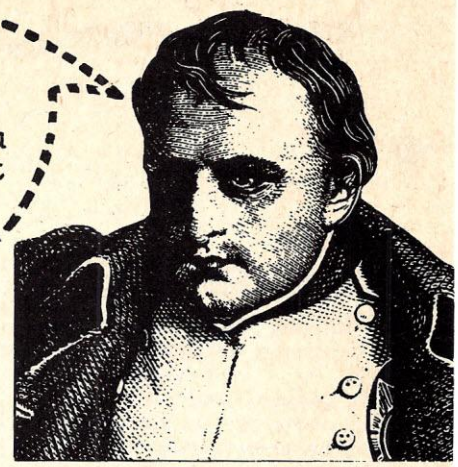
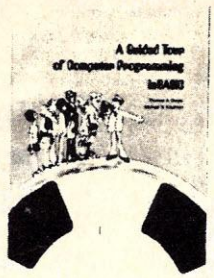


Programming in BASIC

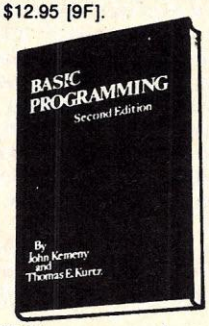
BASIC and the Personal Computer

Dwyer and *Critchfield.* This book will get you involved with personal computing, writing programs and expanding the use of your computer by showing the great diversity of applications possible on any microcomputer. One of the most comprehensive presentations of BASIC ever. As a text or addition to your personal library, this book will tell you all you ever wanted to know about BASIC. 350 pp. $12.95 [9F].



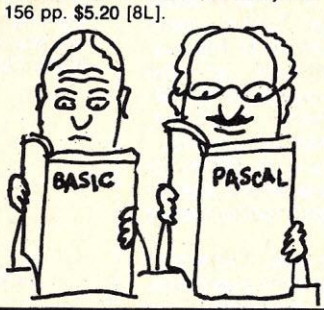
A Guided Tour of Computer Programming In BASIC

Dwyer and Kaufman. This book tops all introductory texts on BASIC. Filled with detail and examples, it includes sample programs for many simulations, several games, reservations systems and payroll. Aimed at the novice, but of value to everyone. 156 pp. $5.20 [8L].



BASIC Programming, 2nd Edition

Kemeny & Kurtz. An introduction to computer programming through the language of BASIC. The authors include in-depth discussions of many applications including files and text processing. 150 pp. **$10.95** [7E]



Basic For Home Computers

Albrecht, Finkel, & Brown. This book shows you how to read, write, and understand the BASIC programming language used in the new personal-size microcomputers. Includes detailed descriptions of everything you need to know to make your computer work for you—includes how to get started, numerous applications and games, lists of resources, much more. 332 pp. **$6.95** [7G]

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Programming in Other Languages

Programming in PASCAL

Peter Grogono. This book is an excellent introduction to one of the fastest growing programming languages today. The text is arranged as a tutorial containing both examples and exercises to increase reader proficiency in PASCAL. Contains sections on procedures, files, and dynamic data structures such as trees and linked lists. 359 pp. $10.95 [10A]

A Fortran Coloring Book

Dr. Roger Kaufman. This book is one of the most entertaining computer programming books around. Learn computer programming the "painfully funny way." Filled with examples and illustrations plus a light sprinkling of jokes. Guaranteed to teach you FORTRAN. 273 pp. $6.95 [4D]

PASCAL User Manual and Report (2nd Edition)

Jensen & Wirth. This book consists of two parts: the User Manual and the Revised Report. The Manual is directed to those who have some familiarity with computer programming and who wish to get acquainted with the PASCAL language. The Report is a concise reference for both programmers and implementors. It defines Standard PASCAL, which constitutes a common base between various implementations of the language. $7.90 [10B]

A Simplified Guide to Fortran Programming

Daniel McCracken. A thorough first text in Fortran. Covers all basic statements and quickly gets into case studies ranging from simple (printing columns) to challenging (craps games simulation). 278 pp. **$12.95** [7F].

Problem Analysis and Programming Style

How to Solve Problems

Wayne Wickelgren. This helpful book analyzes and systematizes some of the basic methods of solving mathematical problems. Illustrative examples include chess problems, logical puzzles, railroad switching problems and ones from science and engineering. For each, the author provides hints for the reader to tackle the problem and then a complete solution is given. Want to solve a complex problem with a computer? Begin here. 262 pp. **$7.50** [7Y].

The Thinking Computer: Mind Inside Matter

Bertram Raphael. Artificial intelligence, or AI, is the branch of computer science concerned with making computers "smarter." With a minimum of technical jargon, this book discusses the capabilities of modern digital computers and how they are being used in contemporary AI research. Discusses the progress of AI, the goals, and the variety of current approaches to making the computer more intelligent. **$8.95** [7X]

The Little Book of BASIC Style: How To Write a Program You Can Read

John M. Nevison. Learn how to write better, easy-to-follow programs with Nevison's rules of style and turn out legible, correct programs. Two hours of BASIC programming is all that is necessary to profit by this book. Concepts of problem-solving and structured programming are included. 160 pp. $5.95 [9V].

The Art of Computer Programming

Donald Knuth. The purpose of this series is to provide a unified, readable, and theoretically sound summary of the present knowledge concerning computer programming techniques, along with their historical development. For the sake of clarity, many carefully checked computer procedures are expressed both in formal and informal language. A classic series. Vol. 1: Fundamental Algorithms, 634 pp. $22.50 [7R]. Vol. 2: Seminumerical Algorithms, 624 pp. $22.50 [7S]. Vol. 3: Sorting and Searching. 722 pp. $22.50 [7T]

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Payroll with Cost Accounting in BASIC

Lon Poole. Includes program listings with remarks, descriptions, discussion of the principles of each program, file layouts, and a complete user's manual with step-by-step instructions, flow charts and sample reports with CRT displays. 356 pp. $15.00 [10W]

How to Profit From Your Personal Computer: Professional, Business and Home Applications

T.G. Lewis. Put your computer to work for you. This new guide describes the use of personal computers in common business applications, including terms, notations, and techniques used by programmers. 256 pp. $8.95 [10X]

Small Computer Systems For Business

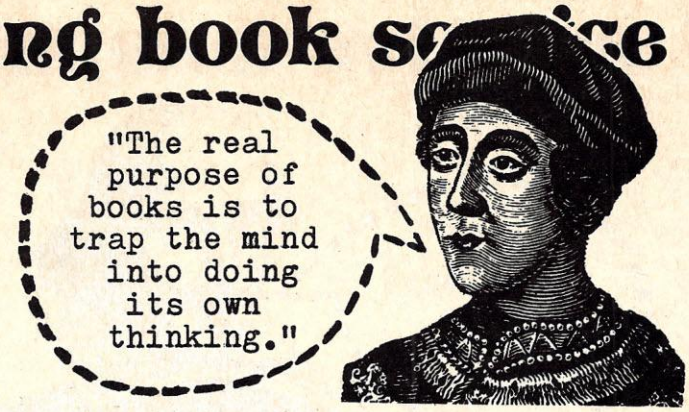
Gerald A. Silver. Useful for operators, programmers, teachers, students, etc., this book explores the world of small computers: what they are, how they are used, their internal structure, and our means of communicating with them. Describes assemblers, interpreters, and compilers, as well as operating systems and small computer applications. 254 pp. **$11.95** [10Y]

Some Common BASIC Programs

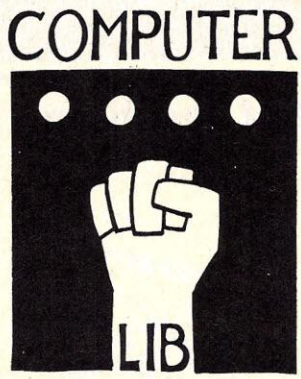
Poole & Borchers. This book combines a diversity of practical algorithms in one book : matrix multiplication, regression analysis, principal on a loan, integration by Simpson's rule, roots of equations, chi-square test, and many more. All the programs are written in a restricted BASIC suitable for most microcomputer BASIC packages, and have been tested and debugged by the authors. **$9.50** [7M]

BASIC With Business Applications

Richard W. Lott. This book focuses on the BASIC language and its application to specific business problems. Part one introduces the BASIC language and the concept of logical flowcharting. Part two presents problems and possible solutions. Topics include: interest rate calculations, break-even analysis, loan rates, and depreciation. This book is a great aid to the beginner wanting to learn BASIC without having a technical or scientific background. 284 pp. **$11.95** [10Z]



Computing Milieu



PCC's Reference Book of Personal and Home Computing

Ever try to find the address of a manufacturer of a cassette interface that a friend told you about 2 weeks ago? Frustrating isn't it? This book will go a long way toward ending that frustration with its comprehensive list of manufacturers, stores and products. Also contains survey articles on software, hardware, kits and applications as well as an index of articles from various hobbyist magazines. Several bibliographies, too. $5.95 [7P].

Computer Lib/Dream Machine

Ted Nelson. This book is devoted to the premise that everybody should understand computers. In a blithe manner the author covers interactive systems, terminals, computer languages, data structures, binary patterns, computer architecture, mini-computers, big computers, microprocessors, simulation, military uses of computers, computer companies, and much, much more. Whole earth catalog style and size. A doozy! 127 pp. $7.00 [8P].

The Home Computer Revolution

Ted Nelson. Here is one of the most controversial books on home computers. Nelson takes a look at how the "dinky" computers got here, where they are where they're going and what will become of the big boys like IBM. This thought-provoking and highly opinionated book picks up where *Computer Lib/Dream Machine* left off. 224 pp. $2.00 [9U].

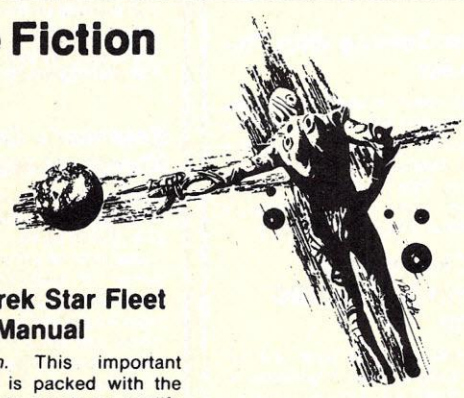
Space and Science Fiction

Star Wars Album

The incredible behind-the-scenes story of the most extraordinary motion picture of our time including over a hundred exclusive photos, special effects secrets, interviews with George Lucas, Carrie Fisher and Mark Hamill, the Anatomy of an Android and a technical glossary. Lots of color. 76 pp. $5.95. [11A]

Masterpieces of Science Fiction

This lavishly illustrated large format book has nine classic stories by Isaac Asimov, Gregory Benford, Ray Bradbury, Arthur C. Clarke, Harlan Ellison, Robert Heinlein, Frank Herbert, A.E. Van Vogt, and Kurt Vonnegut, Jr. Fabulous full color illustrations throughout. 108 pp. $7.95. [11B]



The Star Trek Star Fleet Technical Manual

Franz Joseph. This important resource book is packed with the data you need to create or modify STAR TREK computer games. It includes all Starship operating characteristics, defense and weapon systems, standard orbits, velocity/time relationship, space/war technology, Milky Way galaxy charts, Federation codes, etc., etc. A national best seller. Large format, vinyl binder. 180 pp. $7.95 [8C].

Star Wars Portfolio

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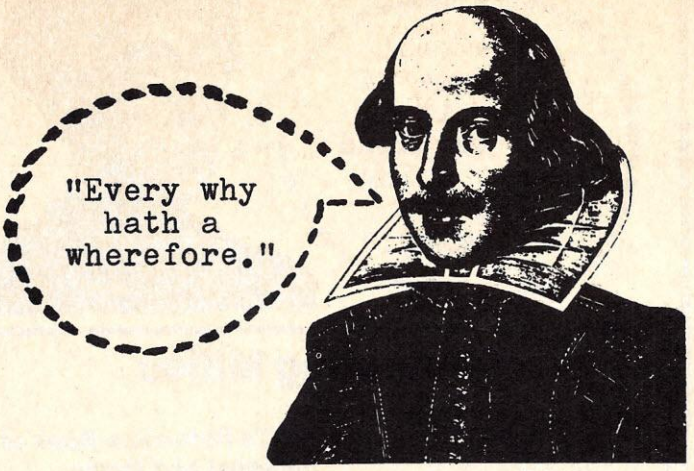


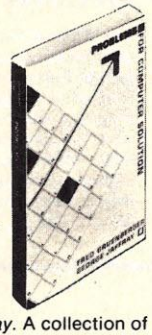
Education & Self Teaching

Using BASIC in the Classroom

Donald D. Spencer. A teacher's guide that makes every phase of teaching computer programming more productive and enjoyable. It gives you fresh but proven ideas for presenting computer and programming topics, scheduling terminal time, purchasing a microcomputer or minicomputer, running the secondary school instructional computer facility, and giving assignments that arouse enthusiasm in your students. 224 pp. **$11.95** [10E]

Be A Computer Literate

Marion Ball & Sylvia Charp. This introductory book is extensively illustrated with full-color drawings, diagrams, and photos. Takes the reader through kinds of computers, how they work, input/output, and writing a simple program in BASIC. Aimed at ages 10-14 but beginners of all ages will find it informative. 62 pp. $3.95. [6H]



Problems For Computer Solution

Gruenberg & Jaffray. A collection of 92 problems in engineering, business, social science and mathematics. The problems are presented in depth and cover a wide range of difficulty. Oriented to Fortran but good for any language. A classic. 401 pp. **$12.50** [7A].

Problems For Computer Solution

Steve Rogowski. The Student Edition is designed to encourage research and preliminary investigation on the part of the student. The problems are ordered by subject and can be expanded or shortened. Mathematical problems that have never been solved are also posed to challenge and sharpen the student's awareness. 98 pp. **$4.95** [9Z]. Also available is the Teacher's Edition which contains solutions, programs and analysis of the problems. 271 pp. $9.95 [9Y]. Both books are highly recommended for any high school or college computer-oriented course.

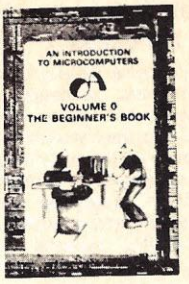
Problem Solving With The Computer

Ted Sage. Used in conjunction with the traditional high school math curriculum, this book stresses problem analysis in algebra and geometry. This is the most widely adopted text in computer mathematics. 244 pp. **$8.95** [8J].

Sixty Challenging Problems with BASIC Solution

Donald Spencer. This book is a vehicle for computer programmers to measure their skills against some interesting problems that lend themselves to computer solution. It includes games, puzzles, mathematical recreations and science and business problems—some hard, some easy. The book will compliment any computer-oriented course in secondary school or college. BASIC program solutions included. 80 pp. $6.95 [9W].

Getting Started



An Introduction to Microcomputers, Vol 0 - The Beginners Book

Adam Osborne. Parts of a computer and a complete system; binary, octal and hexadecimal number systems; computer logic; addressing and other terminology are discussed in a language the absolute beginner can understand. Hundreds of illustrations and photographs. 220 pp. $7.95 [9T]

An Introduction to Microcomputers, Vol 1 - Basic Concepts

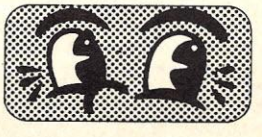
Adam Osborne. Thoroughly explains hardware and programming concepts common to all microprocessors: memory organization, instruction execution, interrupts, I/O, instruction sets and assembly programming. One of the best selling computer texts worldwide. 350 pp. **$9.50** [9K]

Vol 2 - Some Real Microprocessors. Vol 3 - Real Support Devices

Adam Osborne. These volumes complement Volume 1. Vol. 2 discusses the operation of each of the following MPUS in detail: F8, SC/MP, 8080A, Z80, 6800, PPS-8, 2650, COS MAC, 9002, 6100 and seven others. Also information on selecting a micro. Vol. 3 discusses various support and I/O chips. 895 pp.
Vol. 2-(9L) $25.00
Vol. 3-(10Q) $20.00

Beginner's Guide To Microprocessors

Charles M. Gilmore. No background in electronics is necessary to understand this book. It was written for those with no prior knowledge whatsoever of microprocessors or personal computing. Gilmore takes you from what a microprocessor is, how it works and what it's used for to how they're programmed to perform desired functions in microwave ovens, TV games, calculators, etc. 175 pp. $5.95 [7U].



Microprocessors: From Chips to Systems

Rodnay Zaks. A complete and detailed introduction to microprocessors and microcomputer systems. Some of the topics presented are: a comparative evaluation of all major microprocessors, a journey inside a microprocessor chip, how to assemble a system, applications, interfacing (including the S-100 bus) and programming and system development. 416 pp. $9.95 [10S]

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Robert Moody. Tells what personal computers are and what you can do with them in a light entertaining style. Starts with the basics and then covers the technical aspects such as how a personal computer is constructed and how it works. Includes such things as home protection, keeping track of budgets and bills, game playing, inventory management and tax calculations. 139 pp. $4.95 [10T]

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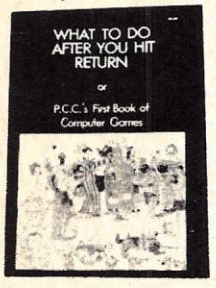

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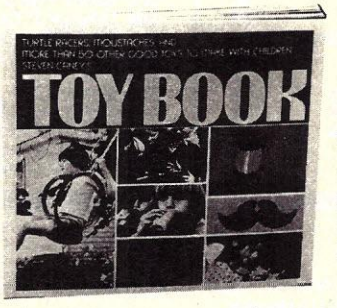

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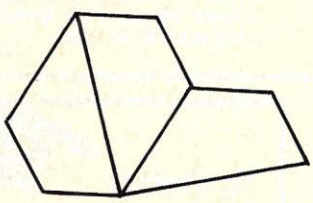
Puzzle Answers

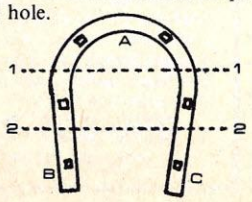
A Remarkable Coincidence: The answer will always be twice the year in question. (In the case of this problem twice 1944 comes to 3888). The year of birth plus the age of each individual in 1944 will equal . . . 1944. The same is true with the year that they took office plus the number of years each served. Once again the answer in each case is 1944.

The Correct Combination: The correct combination is: 9 – 3 – 37. 9 x 3 x 37 = 999. 10 x 5 x 20 = 1000. 11 x 7 x 13 = 1001.

A Problem in Division



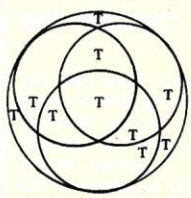
A Betting Proposition: Make your first cut along line 1-1. Then take the top piece of the shoe (A) and place it on top of piece (C). Now make cut 2-2. You will then have 6 pieces each with a nail hole.



A Touching Problem

	2	
6	8	5
4	1	3
	7	

The Puzzle of the Ten Tigers



The Bicycle Puzzle: Henry rode the bike for one hour and covered eight miles. He then left the bike by the side of the road and walked the remaining eight miles, in two hours, to Morristown. After walking for two hours Harriet arrived at the bicycle, and, an hour later she pedaled up to the front of Creative Computing at the same moment as Henry arrived. The total time needed to cover the last 16 miles was three hours.

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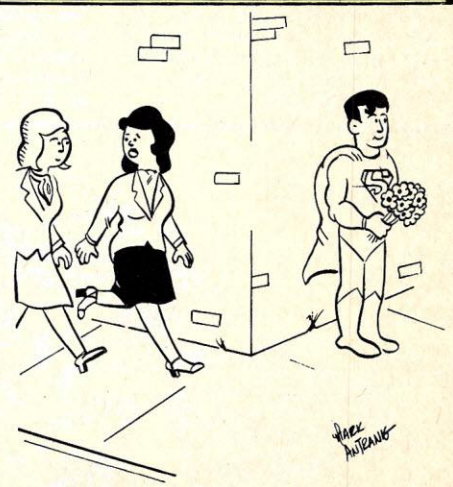
1. Faint heart never won fair lady.
2. Birds of a feather flock together.
3. He who goes a borrowing goes a sorrowing.
4. Take care of the pence, and the pounds will take care of themselves.

A Puzzle With Coins: Lay out nine counters in three rows of three each, so as to form a square. This done, distribute the remaining three as follows: place one counter on the first of the first row, another on the second of the second row, and the third on the last of the third row.



"I doubt this computer matched me with any super person." ©Creative Computing

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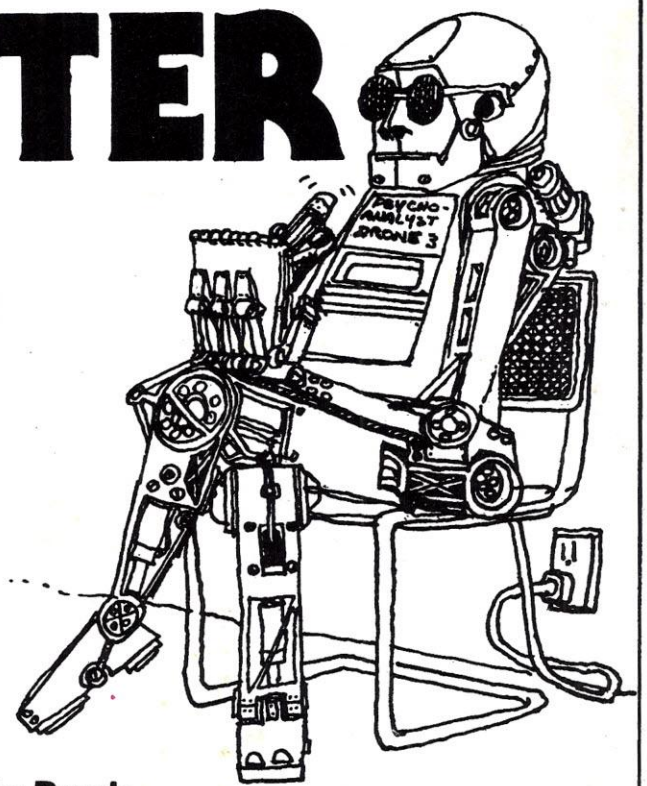

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